Issued September 1969

SOIL SURVEY

Gallatin County, Illinois

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
ILLINOIS AGRICULTURAL EXPERIMENT STATION

Major field work for this soil survey was done in the period 1955–64. Soil names and descriptions were approved in 1966. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1964. This survey was made cooperatively by the Soil Conservation Service and the Illinois Agricultural Experiment Station as part of the assistance furnished to the Gallatin County Soil and Water Conservation District.

Illinois Agricultural Experiment Station Soil Report No. 87.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Gallatin County contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in determining the worth of tracts of land for agriculture, industry, or recreation.

Locating Soils

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

On each sheet of the detailed map, soil areas are outlined and are identified by 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 the survey. This guide lists all of the soils of the county in numerical order by map symbol. It shows the page where each kind of soil is described, and also the page for the management group, woodland group, or any other group in which the soil has been placed.

Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over 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 can learn about use and management of the soils in the section that describes the soils and in the section that discusses management of the soils for crops and pasture, for woodland, and for recreational purposes.

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

Community planners and others interested in recreational developments can read about the soil properties that affect the choice of sites for parks and recreation in the subsection "Use of the Soils for Recreation."

Engineers and builders will find under "Use of the Soils for Engineering" tables that give engineering descriptions of the soils in the county and that name soil features that affect engineering practices and structures.

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

Newcomers in Gallatin County will be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "Additional Facts About the County," which gives further information about the county.

Cover picture: Typical landscape in Gallatin County. In the foreground are wooded Wellston soils. The cropped areas farther back are Patton soils farmed intensively to corn, and the wooded areas in the background are Alford soils.

U.S. GOVERNMENT PRINTING OFFICE: 1969

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

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Issued September 1969

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SOIL SURVEY OF GALLATIN COUNTY, ILLINOIS

BY DONALD L. WALLACE, SOIL CONSERVATION SERVICE, AND J. B. FEHRENBACHER, UNIVERSITY OF ILLINOIS
FIELDWORK BY DONALD L. WALLACE, IN CHARGE, F. L. AWALT, R. E. BOURLAND, F. N. CARROLL, AND L. M. REINEBACH, SOIL CONSERVATION SERVICE [1]

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

GALLATIN COUNTY is in southeastern Illinois (fig. 1). The eastern boundary is formed both by the Wabash River, beyond which lies Indiana, and by the Ohio River, beyond which is Kentucky. White County forms the northern boundary; Saline County, the western boundary; and Hardin County, the southern boundary. Shawneetown, the county seat, is a few miles back from the Ohio River. It was established by moving county offices, houses, and business places, formerly in Old Shawneetown on the banks of the Ohio River, away from damaging floods to a site selected and surveyed by the Federal Government.

The land area of Gallatin County is 327.6 square miles, or 209,664 acres. An additional 3.4 square miles, or 2,176 acres, consists of water areas more than 40 acres in size or more than one-eighth of a mile in width.

Additional Facts About the County

This section gives general information about Gallatin County. It briefly discusses the organization and development of the county and the agriculture and then describes the climate.

Organization and Development

Gallatin County was organized in 1812. It was one of the first five counties established in Illinois and made up an area from which 15 counties eventually developed. The county was settled by people who came down river from the northeast and overland from the southeast. A ferry operated across the Ohio River from 1810 until the present bridge was completed. The first bank in the State was at Shawneetown, and for many years in the 1800's, Gallatin County was the financial and cultural center of Illinois.

The population of the county was 7,638 in 1960, according to the U.S. Census. Most of the people work in agriculture or in related industries. Some persons, however, find employment in the oil industry, in coal mining, and in such small industries as local sawmills and a factory where cabinets are made. Production of crude oil was important at one time, and income from this source once paid about 18 percent of the taxes in the county. Since 1956, however, production of oil has steadily declined. Coal mining is a minor industry in the county. One shaft mine is in operation at Equality, and small surface mines are scattered throughout the county.

In addition to the agriculture and industries, recreation is an expanding enterprise. Part of the Shawnee National

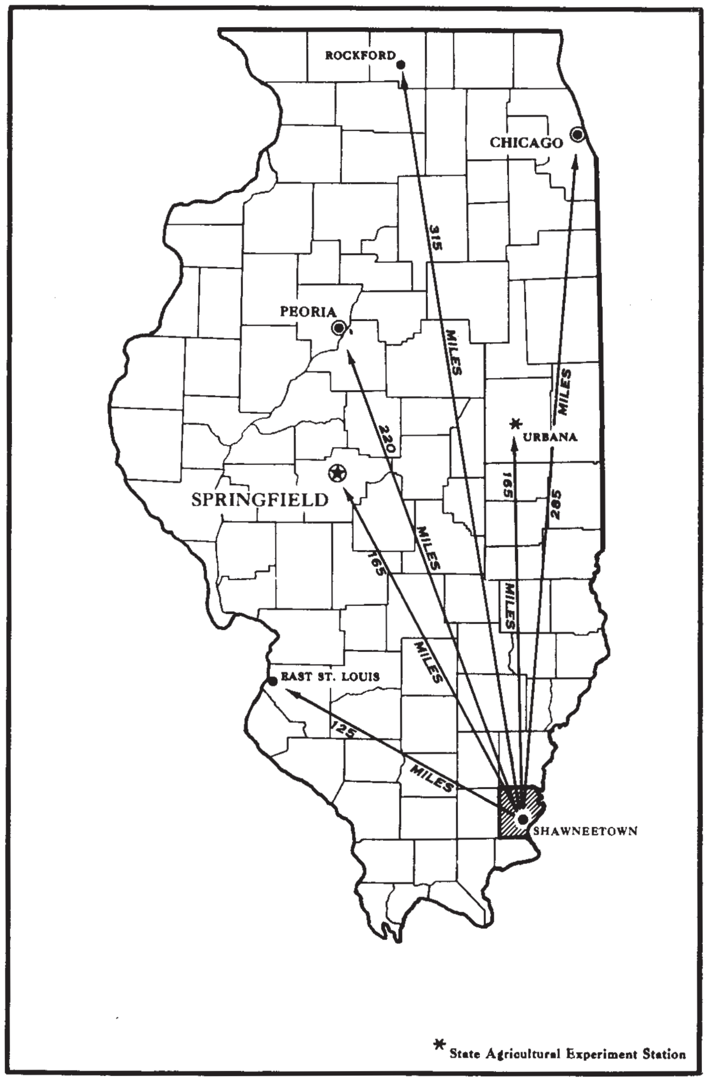

Figure 1.—Location of Gallatin County in Illinois.

[1] Others who contributed to the fieldwork include D. W. HOPKINS, C. C. MILES, and W. D. NETTLETON.

Forest is in the county. The forest, related camping areas, and many historical sites bring many people into the area for relaxation. Also, sportsmen enjoy hunting in the forests and fishing in the rivers and other streams and in the lakes and farm ponds.

Transportation for moving products to market is provided by the Baltimore and Ohio Railroad and the Louisville and Nashville Railroad. In addition a barge terminal at Old Shawneetown is a shipping point for coal and grain that come from areas throughout the basins of the Ohio and Mississippi Rivers. Three principal State Highways—Routes No. 1, No. 13, and No. 141—serve the county. Other paved roads and roads surfaced with gravel connect farms throughout the county with marketing centers.

Agriculture

Agriculture is the main enterprise in Gallatin County. Most of the farm income comes from cash grain crops. The soils in the central and northern parts of the county are cropped intensively to corn and soybeans. In the southern part, on the strongly sloping and shallow soils, are large wooded tracts interspersed with pasture. Livestock is raised mainly in this part of the county because pasture is most extensive here.

About 80 percent of the land in farms is in corn, soybeans, wheat, and popcorn. Watermelons and pecans are grown on a small acreage. Gallatin County has led the State in production of popcorn for many years. Most of the popcorn is sold and processed locally, and most of the wheat is sold to local elevators. The livestock raised is sold mainly in Evansville, Ind.

The farms in the county have steadily decreased in number and increased in size since 1910. In that year there were 1,563 farms, and their average size was 104 acres. In 1964, according to the U.S. Census of Agriculture, there were 461 farms in the county and their average size was 336.3 acres.

Climate [2]

Gallatin County has a continental climate typical of southern Illinois. Low pressure areas, or storm centers, and their associated weather fronts bring frequent changes in temperature, humidity, amount of cloudiness, and wind direction during much of the year.

Table 1 gives the average monthly and yearly temperatures and precipitation typical for the county, as well as the probabilities of receiving specified amounts of precipitation 1 year in 10. Table 2 gives figures that indicate for the period March 1 through November 21, the chances of receiving specified amounts of precipitation during 1-week and 2-week periods.

The average annual precipitation is about 45 inches but varies from less than 39 inches of rainfall to more than 50 inches. The driest months are September, October, and December when the average precipitation is 3 inches or less a month. In July and August the average precipitation is 3.8 inches. Major droughts are infrequent, but fairly prolonged dry periods during part of the growing season are not uncommon. These dry periods can be critical for best growth of such summer crops as corn and soybeans.

Precipitation in summer comes mostly as showers or thunderstorms that are of brief duration. Thunderstorms occur on an average of about 50 days each year and occasionally are accompanied by hail and damaging wind. An average of less than three hailstorms occur annually at a given location in the county. In June, July, and August the average number of hailstorms is less than one a year (*9*).[3]

[2] By WILLIAM L. DENMARK, Weather Bureau Climatologist for Illinois, ESSA, Department of Commerce.

[3] Italic numbers in parentheses refer to Literature Cited. p. 134.

TABLE 1.—*Temperature and precipitation for Gallatin County, Ill.*

[Temperature and snowfall data based on records from Harrisburg, Ill.; other precipitation data based on records from Old Shawneetown and from Shawneetown]

Month	Temperature			Precipitation			
	Average daily maximum	Average daily minimum	Average daily	Average monthly total	One year in 10 will have— Less than—	One year in 10 will have— More than—	Mean monthly snowfall
	° F.	*° F.*	*° F.*	*Inches*	*Inches*	*Inches*	*Inches*
January	45	26	36	4. 4	0. 8	10. 5	4. 2
February	48	28	38	3. 2	. 8	6. 8	4. 3
March	59	37	48	4. 8	1. 3	10. 1	2. 4
April	70	46	58	4. 4	2. 1	7. 0	. 3
May	79	55	67	4. 2	1. 5	6. 8	0
June	88	64	76	3. 9	1. 0	8. 0	0
July	92	67	80	3. 8	. 9	7. 2	0
August	91	66	78	3. 8	1. 3	7. 5	0
September	85	58	72	3. 0	. 6	5. 5	0
October	73	47	60	2. 7	1. 0	6. 0	. 1
November	59	36	48	3. 6	1. 0	6. 9	. 7
December	47	29	38	3. 0	1. 3	7. 0	2. 8
Year	70	46	58	44. 8	32. 9	65. 9	14. 8

TABLE 2.—*Chances of receiving selected amounts of precipitation in Gallatin County, Ill.*[1]

Period	During 1-week period				During 2-week period		
	Chance of trace or less	Chance of 0.40 inch or more	Chance of 1 inch or more	Chance of 2 inches or more	Chance of trace or less	Chance of 1 inch or more	Chance of 2 inches or more
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
March 1–7	6	60	28	8	0	68	36
March 8–14	9	66	40	17			
March 15–21	9	62	37	16	2	68	41
March 22–28	7	70	42	17			
March 29–April 4	13	61	33	12	0	72	39
April 5–11	2	76	43	14			
April 12–18	13	62	38	17	4	62	33
April 19–25	11	51	24	7			
April 26–May 2	11	72	40	12	2	64	34
May 3–9	15	56	29	9			
May 10–16	15	56	33	15	2	63	35
May 17–23	15	64	35	11			
May 24–30	17	54	30	11	0	54	29
May 31–June 6	13	55	28	9			
June 7–13	24	58	35	15	7	58	30
June 14–20	17	51	23	6			
June 21–27	7	59	33	12	0	62	31
June 28–July 4	22	54	29	10			
July 5–11	26	49	29	12	4	57	30
July 12–18	22	55	32	12			
July 19–25	19	55	28	9	2	49	22
July 26-August 1	24	44	20	5			
August 2–8	19	50	23	6	2	54	26
August 9–15	15	57	31	11			
August 16–22	15	53	30	12	6	54	29
August 23–29	30	47	27	11			
August 30–September 5	26	45	23	8	6	46	20
September 6–12	26	46	22	6			
September 13–19	37	40	22	9	11	48	26
September 20–26	28	49	30	13			
September 27–October 3	32	50	30	13	7	52	29
October 4–10	28	46	27	12			
October 11–17	37	37	21	9	16	44	22
October 18–24	33	48	27	10			
October 25–31	33	40	20	7	15	42	20
November 1–7	30	47	23	7			
November 8–14	20	48	20	5	6	51	26
November 15–21	24	52	31	14			

[1] Probabilities in this table show mainly the expected seasonal pattern of rainfall.

STATISTICIANS NOTE: The values in the table are correct within ±5 to 20 percent with an expectancy of 95 percent.

Summers are warm to hot, and humidity is high. Occasionally the hot periods are prolonged. Temperatures of 90° F. or higher occur on an average of about 70 days a year. In more than 75 percent of the summers, the maximum temperature is 100° or higher. The highest temperature recorded was 113° on July 13, 1936.

On the average, January is the coldest month of the year. The coldest temperature recorded, however, was −23° on February 2, 1951.

Data for wind and sunshine are not available in Gallatin County, but they should approximate that from Evansville, Ind., which follows. In an average year, about 45 percent of the days are cloudy, and the rest are equally divided between clear days and partly cloudy days. From June through September about 75 percent of the days are sunny, but the number of days having sunshine decrease to about 40 percent in December and January. Prevailing winds are southwesterly most of the year, although winds from the northwest predominate from January through March and in October. The average wind velocity ranges from a high of 11 miles an hour in March to a low of 6 miles an hour in August.

The average date of the last temperature of 32° or lower in spring is April 12, and the average date of the first freeze in fall is October 20. In about 1 year in 4, a temperature of 32° or lower occurs after April 19, and similarly, the first freeze in fall comes before October 11.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Gallatin 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 traveled over the county, they observed steepness, length, and shape of slopes; size and speed 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 the rock material that has not been changed much by leaching or by roots of plants.

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 nationwide, uniform procedures. For successful use of this survey it is necessary to know the kinds of groupings most used in a local 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 soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Uniontown and Wabash, 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 those characteristics that go with their behavior in the natural landscape. Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that are alike except for texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Darwin silty clay and Darwin silt loam, overwash, are two soil types in the Darwin series. Darwin silt loam, overwash, has a profile like that of Darwin silty clay, except that it has been covered during floods by a layer of silt loam.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. In Gallatin County soil types are divided into phases primarily on the basis of difference in slope or degree of erosion because these differences affect management. For example, Alford silt loam, 1 to 4 percent slopes, is one of several phases of Alford silt loam, a soil type that ranges from nearly level to steep.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew soil boundaries on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map at the back of this survey was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed, and so small in size, that it is not practical to show them separately on the map. Therefore, such an area is shown as one mapping unit and is called a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it. For example, the Wellston-Berks complex in Gallatin County consists mainly of Wellston silt loam and Berks stony loam. The soil scientist may also show as one mapping unit two or more soils that have differences not significant enough to make it practical to show them separately on the map. Such a mapping unit is called an undifferentiated soil group. An example is Wynoose and Weir silt loams. Most surveys also include areas where the soil material is so rocky, so shallow, or so frequently worked by wind and water that it cannot be classified by soil series. In this survey special symbols are used on the legend for the detailed soil map to designate small areas of borrow pits, strip mines, mine dumps, sand quarries, gravel pits, and made land. Spot symbols are used to designate small areas of calcareous soils.

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

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the published soil survey. On basis of the yield and practice tables and other data, the soil scientists set up trial groups, and then test them by further study and by consultation with farmers, agronomists, engineers, and others. Then, the scientists 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 present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Gallatin County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The soil associations in Gallatin County are described in the pages that follow and are shown on the colored map at the back of this survey.

1. Alford-Wellston Association

Deep to shallow, moderately permeable or moderately slowly permeable, gently undulating to steep soils

In this association are gently undulating soils on fairly narrow ridgetops and rolling to steep soils in lower areas nearby. The areas are in the uplands throughout the county, but the largest area is near Shawneetown. Some of the soils formed in loess 8 feet or more deep (fig. 2), and others formed in areas where the loess was fairly shallow over sandstone or was lacking. Permeability of the soils is moderate to moderately slow. This association makes up about 10 percent of the county.

Dominant in this association are the Alford and Wellston soils. Iva soils and other minor soils are also in the association. Alford soils make up about 75 percent of this association; Wellston soils, about 10 percent; Iva soils, about 5 percent; and other minor soils, about 10 percent.

Figure 2.—**A roadbank in the Alford-Wellston association in an area where the deposit of loess is deep.**

Alford soils formed in deep deposits of loess on the ridgetops and are gently rolling to strongly rolling. The rolling to steep Wellston soils formed in loess that has been thinned, mainly by geologic erosion, and in these soils the depth to sandstone material commonly is less than 40 inches. Because the mantle of loess is thin, sandstone fragments and outcrops of sandstone are common in the Wellston soils.

The minor Iva soils are gently undulating and occupy a small area in the northern part of the county near Cottonwood. These soils formed in a thick mantle of loess. They are somewhat poorly drained. Other minor soils occupy steep slopes on the north and west sides of Shawneetown Hills and Gold Hill, north and south of Shawneetown. Here the mantle of loess is very thick and coarse textured. The soil profile is weakly developed, because erosion is rapid in these areas and removes the soil material almost as soon as it is formed.

The dominant soils in this association generally are medium acid to very strongly acid, low in available phosphorus, and medium to high in available potassium. The content of organic matter is medium to low in the Alford soils and low in the Wellston. Erosion is a hazard, for loess is erodible and the topography is mostly rolling to steep. Because the underlying loess and other material are permeable, it is risky to construct ponds and similar structures.

Many of the rolling to steep areas in this association are wooded, but the less strongly sloping areas have been cleared. The trees are mostly those of the yellow poplar-white oak forest type or of the white oak-red oak-hickory forest type.

The Alford soils on the ridgetops and in less sloping areas are well suited to farming. Most of the many cleared areas of Alford soils that were once severely eroded have been improved by good management. These areas are now in pasture or are used for grain in cropping systems that include grasses and legumes. Hilly areas of the Alford and Wellston soils are well suited to pasture and trees. The steep Wellston soils have more limited suitability as pasture or woodland. Much of the hilly and steep acreage is in the Shawnee National Forest and has been reforested.

2. Hosmer-Wellston-Berks Association

Deep to shallow, moderately permeable to slowly permeable, gently undulating to steep soils

This association consists of gently undulating soils on fairly narrow ridgetops and undulating to steep soils in lower areas nearby. The areas are in the uplands and are mostly in the western part of the county. Some of the soils formed in loess 5 to 8 feet or more deep over sandstone or glacial till. Others formed in areas where the loess was shallow over sandstone (fig. 3) or was lacking. Permeability of the soils is moderate to slow. About 12 percent of the county is in this association.

The Hosmer, Wellston, and Berks soils are dominant in this association (fig. 4). Also in the association are small areas of Stoy, Weir, and similar soils. Hosmer soils make up about 50 percent of the association; Wellston soils, about 9 percent; closely intermingled Wellston and Berks soils, about 32 percent; and the minor soils, about 9 percent.

Figure 3.—Typical Wellston soil, which is shallow over sandstone, in a roadcut.

The Hosmer soils are gently undulating to rolling and occupy ridgetops and slopes. These soils have a dense, silty, very slowly permeable layer, or fragipan, at a depth of less than 3 feet.

Wellston soils are in rolling areas, where geologic erosion has thinned the mantle of loess to less than 40 inches. They also occupy steep areas, where they occur in an intricate pattern with Berks soils. Berks soils consist of silty material that is less than 20 inches deep over sandstone. Rock fragments and rock outcrops are common in the steep areas of both of these soils.

The minor soils are nearly level to gently sloping and are in the northwestern part of the county. The Stoy soils are somewhat poorly drained, and the Weir and Wynoose soils are poorly drained.

The dominant soils in this association are strongly acid or very strongly acid, low in available phosphorus, and low to high in available potassium. The available moisture capacity is moderate in the Hosmer and Wellston soils and low in the Berks. Fertility is low. The hazard of erosion is severe. Large rocks and rock outcrops in the steep areas hinder use of farm machinery. Because of the underlying sandstone, it is risky to construct ponds, waterways, and other permanent structures (fig. 5).

Many of the rolling to steep areas in this association are wooded, but the more gently sloping areas all have been cleared. The trees in native wooded areas are mainly those of the white oak-red oak-hickory forest type. In reforested areas, pine has been planted.

The Hosmer soils on the ridgetops and those in less sloping areas are well suited to farming. Many of the cleared areas have been severely eroded and are now idle (fig. 6). Under good management a few of the severely eroded areas have been improved and are now in pasture or are used for grain in cropping systems that include grasses and legumes. The hilly Hosmer and Wellston soils are well suited to pasture and trees. The steep Wellston soils and all of the Berks soils have more limited suitability as pasture or woodland. Much of the hilly and steep acreage has been reforested and is in the Shawnee National Forest.

3. Ava-Hickory-Bluford Association

Deep, moderately slowly permeable or slowly permeable, gently undulating to hilly soils

This association consists of dominantly gently sloping and gently undulating soils on ridgetops and gently rolling to hilly soils on slopes nearby. The areas are in the uplands in the northwestern part of the county, north of White Oak Creek. Some of the soils formed in loess 20 to 60 inches deep over glacial till, and others formed in areas where the loess was less than 20 inches thick over the till or was lacking. The till contains small pebbles and sand. It is exposed on the severely eroded slopes and in draws and coves in the association. Permeability of the soils is moderately slow or slow. This association makes up about 2 percent of the county.

Dominant in this association are the Ava, Hickory, and Bluford soils. Minor areas of Wynoose, Weir, Creal,

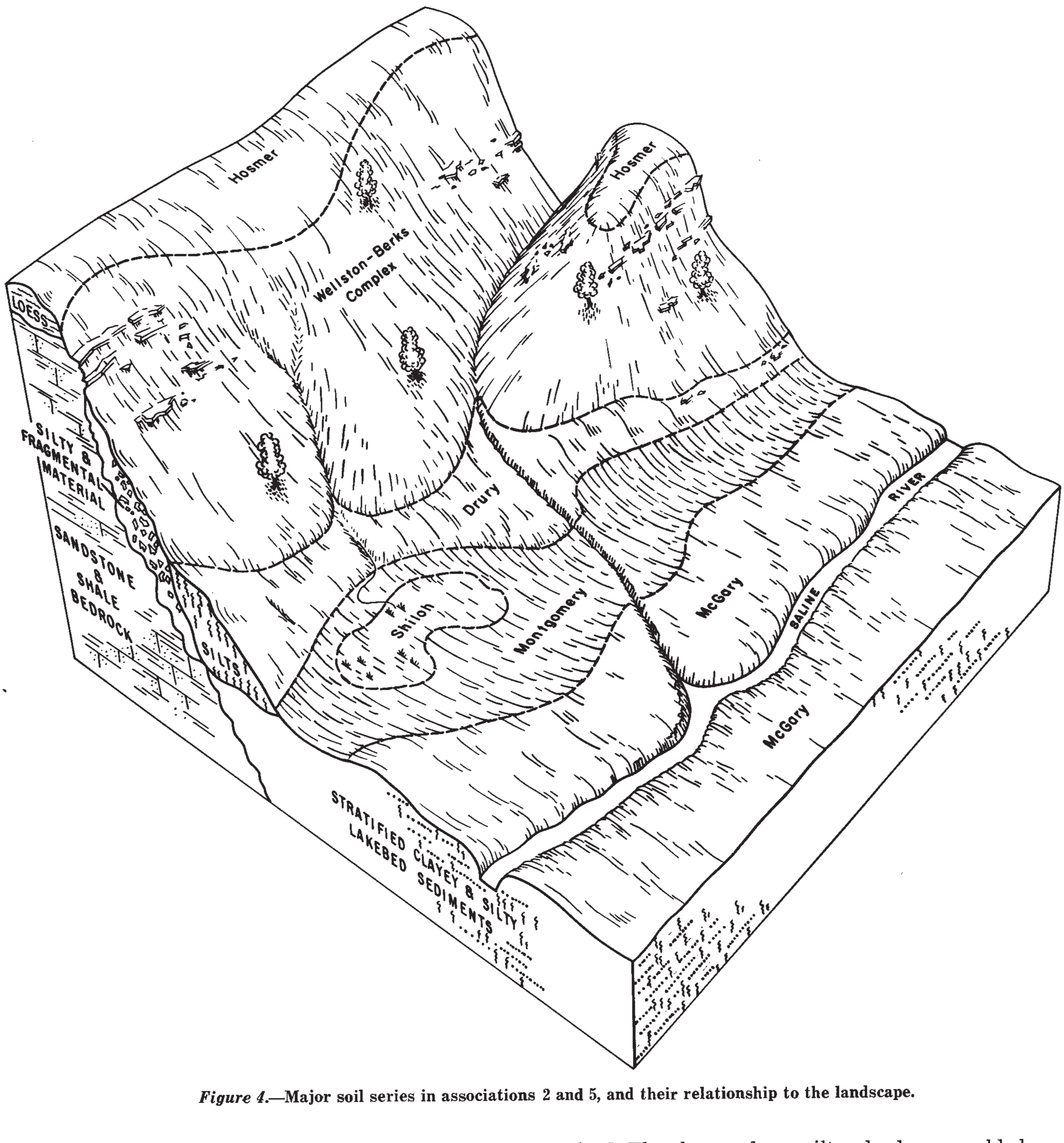

Figure 4.—**Major soil series in associations 2 and 5, and their relationship to the landscape.**

and Racoon soils are also in the association. Ava soils make up about 40 percent of this association; Hickory soils, about 30 percent; Bluford soils, about 20 percent; and the minor soils, about 10 percent.

Ava soils formed on the ridgetops and nearby slopes in loess 20 to 50 inches thick. These soils are very gently sloping to gently rolling and are moderately well drained. They have a dense, silty, slowly permeable layer, or fragipan, at a depth of about 25 inches.

The well-drained Hickory soils are gently sloping to moderately steep and occupy slopes adjacent to bottom lands. These soils formed partly in Illinoian glacial till exposed by geologic erosion and partly in loess, as much as 20 inches thick in some places.

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Figure 5.—**Typical view of Wellston and Berks soils, which are shallow over sandstone.**

Bluford soils are nearly level to undulating and are somewhat poorly drained. Like the Ava soils, Bluford soils formed in loess 20 to 50 inches thick.

The minor Wynoose and Weir soils are poorly drained. These soils have a dense, impermeable layer, or claypan, at a depth of about 16 to 20 inches. Areas of Wynoose and Weir soils are known locally as "post oak flats."

The dominant soils in this association are strongly or very strongly acid, are very low or low in available phosphorus, and are low or medium in available potassium. The available moisture holding capacity is moderate in the Ava soils, high in the Hickory soils, and moderate to high in the Bluford. Fertility and content of organic matter are low in these soils. Wetness is a problem in the nearly level areas. Tile drains do not work because of the very slowly permeable material in the subsoil of some of these soils. Permeability, and in some places slopes, make erosion a hazard in areas of Ava and Bluford soils that are cultivated.

Small wooded areas ranging from 1 to 20 acres in size are scattered throughout the association. The trees are of the oak-hickory forest type.

Soils in this association are probably better suited to hay or pasture than to other uses. The Ava and Bluford soils on the ridgetops and less sloping areas are well suited to farming, though erosion generally is a hazard if the soils are cultivated. Rolling areas of the Ava and Hickory soils were cleared at some time, but because of erosion are now idle. Much of this rolling acreage has a cover of sassafras and persimmon sprouts, blackberry briers, and broomsedge. Under good management a few of the rolling areas have been improved and are now in pasture.

4. Alvin-Roby-Ruark Association

Deep, slowly permeable to moderately rapidly permeable, nearly level to hilly, sandy soils

Soils of this association are deep, nearly level to hilly fine sandy loams. They are in the uplands. A fairly narrow area begins near Willow Pond Slough, south of New Haven, and extends in a southwesterly direction toward the town of Junction. Other areas are on west-facing slopes of the Shawneetown Hills or are on Gold Hill and other hills north and south of Shawneetown. Most of the areas are nearly level to undulating. A few, long, narrow areas north and west of Cypress Ditch and south of Junction are rolling, and some other areas are undulating to hilly. Permeability of the soils is slow to moderately rapid. About 7 percent of the county is in this association.

Figure 6.—**Rolling areas of a Hosmer silt loam that are severely eroded and gullied.**

The Alvin, Roby, and Ruark soils are dominant in this association. Also in the association are minor areas of Bloomfield, Lamont, and Onarga soils. Alvin soils make up about 40 percent of this association; Roby soils, about 25 percent; and Ruark soils, about 15 percent. Of the remaining 20 percent, about 10 percent is Lamont soils, and the other 10 percent consists of equal parts of Bloomfield and Onarga soils.

Alvin soils are gently undulating to gently rolling and occupy ridgetops and slopes. These soils are well drained and have a subsoil that is well developed. The Roby soils are nearly level to undulating and are somewhat poorly drained. These soils are closely associated with the Ruark soils, which are poorly drained and generally require artificial drainage. The largest areas of the Alvin, Roby, and Ruark soils are in the northeastern part of the county.

The minor Lamont soils are undulating to rolling and are closely associated with the Bloomfield soils, which are gently rolling to hilly. These minor soils are mostly south of the town of Junction. They have a subsoil that contains little clay and are droughty. Interspersed with the dominant soils in the association near Inman are small areas of the dark-colored, well-drained Onarga soils.

The dominant soils in this association are slightly acid to very strongly acid and are low in available phosphorus and potassium. The available moisture holding capacity is moderate. Wind and water erosion are hazards in the undulating to hilly areas, and wetness is a problem in the nearly level, somewhat poorly drained areas.

Except for the hilly areas west of Shawneetown and south of Gold Hill, most of this association has been cleared. The nearly level to undulating Alvin soils are well suited to farming and are used for general farming and for growing grain. The Roby soils are used for grain, to which they are well suited. The gently rolling and rolling areas of Alvin and Lamont soils are well suited to pasture and are used mainly for these purposes. Watermelons are grown on the less sloping Lamont soils. Much of the gently rolling and hilly acreage of Lamont and Bloomfield soils has been cleared and farmed at some time. This acreage now is mostly in native pasture consisting of grasses and shrubs.

5. McGary-Montgomery-Markland Association

Deep, very slowly permeable to moderately slowly permeable, nearly level to gently rolling, silty and clayey soils

In this association are deep, nearly level to gently rolling soils on terraces and gently undulating to gently rolling soils on narrow breaks and in waterways and coves (see figure 4). The areas are adjacent to the Saline River and to the North Fork of the Saline River, and the largest ones are north and south of the town of Equality. The soils nearest the streams and rivers are light colored and are fairly well drained, but those in slightly depressional areas are dark colored and are poorly drained. All of the soils formed in clayey sediment and have very slow to moderate permeability. This association makes up about 8 percent of the county.

Dominant in this association are the McGary, Montgomery, and Markland soils. Okaw soils, and the Darwin, Reesville, Uniontown, and other minor soils, are also in the association. McGary soils make up about 35 percent of this association; Montgomery soils, about 30 percent; Markland soils, about 15 percent; Okaw soils, about 5 percent; and all other minor soils, about 15 percent.

McGary soils are light colored. These soils generally occupy areas between the dark-colored Montgomery soils and the light-colored Markland soils. In places McGary soils occupy nearly level areas, but in other places they are on short slopes in waterways that extend into broad, nearly level areas. Montgomery soils occupy nearly level to slightly depressional areas and are poorly drained. Markland soils, in long irregular areas, are gently sloping to strongly sloping and are well drained.

The minor Okaw soils are in depressional areas within broad areas of the McGary soils and are poorly drained.

In general, the light-colored soils are very strongly acid and the dark-colored soils are neutral. In all of the dominant soils, available phosphorus is low and available potassium is medium to high. Available moisture holding capacity is moderate in the McGary and Markland soils and high in the Montgomery soils. The very slow permeability of the light-colored soils makes erosion a serious hazard in sloping areas. Wetness is a problem in most places. The nearly level areas require artificial drainage, but because of the very slowly permeable subsoil in the McGary and Okaw soils, these soils require surface drainage. Under good management tile drains work well in the more permeable Montgomery soils.

The dark-colored soils in this association are mostly all cleared. Many areas of the light-colored soils are wooded, and these wooded areas are intermingled with small cleared areas. The trees are mostly blackjack oak, post oak, and hickory.

If drained, areas of the nearly level Montgomery soils are well suited to intensive farming. Areas of the nearly level McGary soils and the gently sloping McGary and Markland soils are less suited to farming. Undulating and rolling areas of soils in the association are suited to only limited use for farming. Some areas, once cleared and farmed, have become eroded and are now idle. Flooding restricts use of such areas to hay or pasture.

6. Reesville-Patton-Uniontown Association

Deep, moderately slowly permeable or moderately permeable, nearly level to gently rolling, silty or clayey soils

The soils in this association are deep, are nearly level to gently rolling, and occupy broad terraces throughout the county. The terraces generally are nearly level but are marked by gently undulating to undulating rises. The largest area lies along State Route 1 from its intersection with State Route 13, northward to Cane Creek, and then eastward through Ridgway Township and Cottonwood to State Route 141. The soils formed from silty or clayey material that was highly fertile. Some of the soils formed under forest and are light colored, and others formed under grass or in swamps and are dark colored. Permeability of the soils is moderately slow or is moderate. This association makes up about 24 percent of the county.

The Reesville, Patton, and Uniontown soils are dominant in this association (fig. 7). Also in the association are small areas of Sexton soils and of Camden, Harco, Marissa, Montgomery, Starks, Worthen, and other similar soils. Reesville soils make up about 30 percent of the association; Patton soils, about 25 percent; Uniontown soils, about 15 percent; Sexton soils, about 5 percent; and other minor soils, about 25 percent.

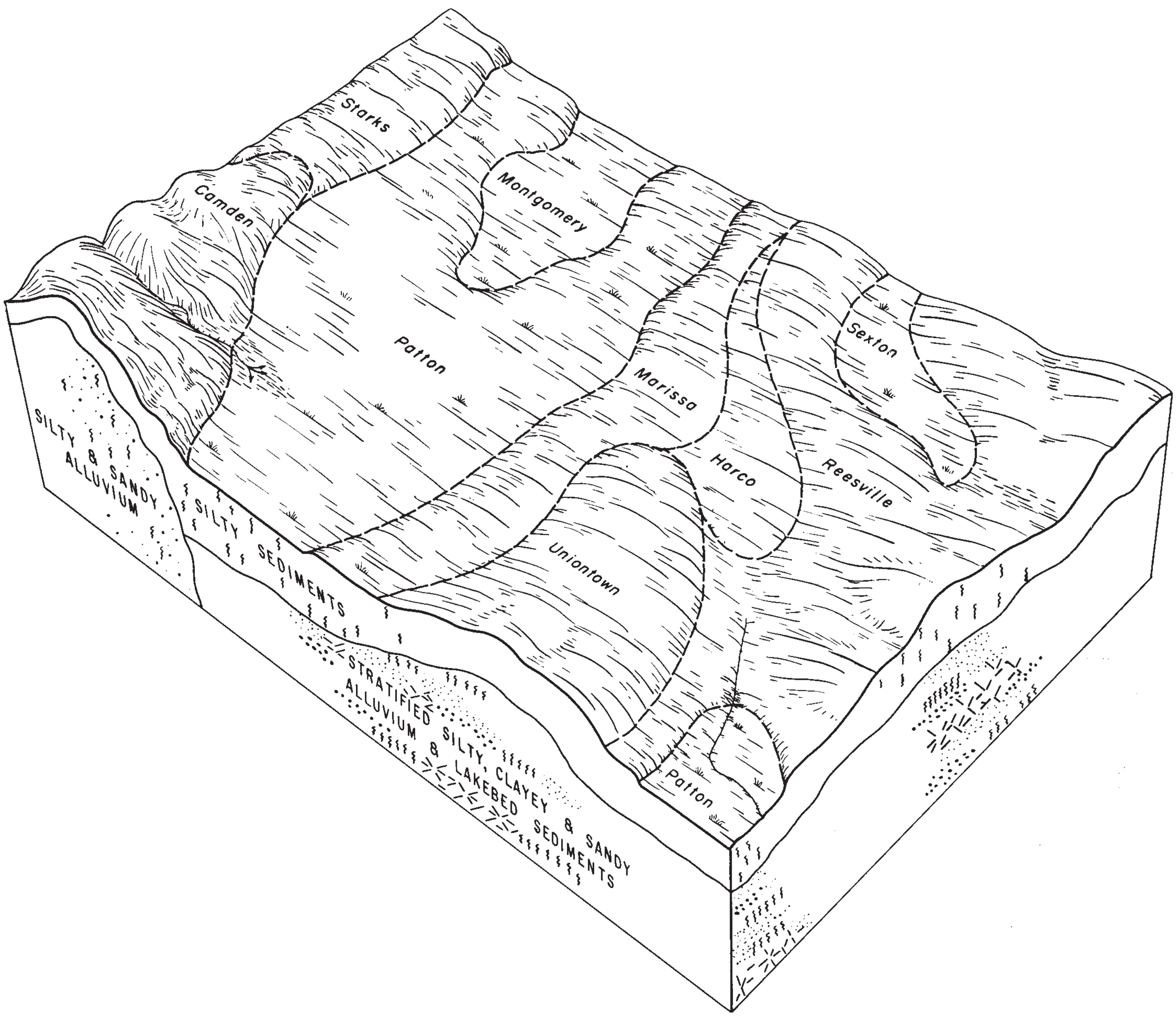

Figure 7.—**Major soil series in association 6 and their relationship to the landscape.**

Reesville soils are nearly level to undulating and occupy slightly elevated areas throughout the association. Patton soils are nearly level and in places occupy large slightly depressional areas. Other areas of the Patton soils are small and are interspersed within gently undulating areas of Reesville and Uniontown soils. Uniontown soils are associated with the Reesville soils. They are light colored, gently undulating to gently rolling, and well drained.

The minor Sexton soils are light colored and poorly drained. They are nearly level to depressional and are within areas of the Reesville soils.

Of the dominant soils, the Reesville and Uniontown generally are medium acid to strongly acid, are low to medium in available phosphorus, and are medium in available potassium. The Patton soils, on the other hand, normally are neutral, low in available phosphorus, and medium to high in available potassium. Available moisture holding capacity generally is high in the dominant soils. Wetness is a problem in the nearly level areas of the association, and erosion is a hazard in the sloping areas. Tile can be used to provide drainage. The size and shape of the sloping areas make control of erosion difficult.

Soils in this association generally are suited to farming. Most areas are farmed, and the fields typically are large and unfenced. Few trees are on the soils. Less than a hundred years ago, however, the soils were too wet to cultivate and had a cover of pecan, swamp oak, red oak, gum, and maple trees. Because the soils are fairly permeable and highly fertile, however, they have been drained through use of dredged ditches and tile drains. Most areas are now farmed intensively, but the sloping areas are less suited to intensive farming than the other areas. Also, areas that are small and irregular are better suited to hay and pasture than to other uses. Management generally is good.

7. Darwin-Shiloh-Wabash Association

Deep, very slowly permeable to moderately slowly permeable, nearly level, clayey soils

In this association are deep, nearly level soils on low terraces. The areas are on both sides of Cypress Ditch, south and northeastward from Junction, and are nearly level to depressional. The soils formed in very fine material that settled out of stagnant water. Permeability is very slow to moderately slow. This association makes up about 5 percent of the county.

Dominant in this association are the Darwin, Shiloh, and Wabash soils. The Harpster, Sawmill, and other minor soils also are in the association. Darwin soils occupy about 45 percent of this association; Shiloh soils, about 25 percent; Wabash soils, about 20 percent; and minor soils, about 10 percent.

Darwin soils are high in clay and are poorly drained. Shiloh soils also are high in clay, but they have stronger structure than the Darwin and Wabash soils and contain calcareous material at a depth of less than 50 inches. Wabash soils have a thicker and darker colored surface layer than that in the Darwin soils, but they are similar to those soils in content of clay and in drainage. Areas of Darwin and Wabash soils within this association are separated by soil material that contains snail shells throughout.

Soils in this association generally are neutral in reaction and are low to high in available phosphorus and potassium. The available moisture holding capacity is high. Wetness is the major problem. Tile drains are not suitable for drainage, but surface drains can be used. Outlets are difficult to locate because the general position of the area on the landscape is low. Flooding also is a problem, and because of the flooding, infestation by johnsongrass is a serious problem.

Much of this association was once wooded, but large areas are rapidly being cleared. All of the soils are suited to farming but are limited to summer crops because of frequent flooding in spring. The high clay content of the soils makes preparing a seedbed difficult. Fall plowing is needed for adequate seedbed preparation in spring.

8. Emma-Sexton-Weinbach Association

Deep, very slowly permeable to moderately slowly permeable, nearly level to undulating, silty soils

This association consists of deep, nearly level to undulating soils on low terraces, or benches. Most of the areas are in the eastern part of the county, but some areas are along the Saline River in the south-central part. The nearly level areas are on the benches, and the undulating areas are on slopes and breaks to drainageways. Permeability of the soils is very slow to moderately slow. This association makes up about 5 percent of the county.

The Emma, Sexton, and Weinbach soils are dominant in this association (fig. 8). Also in the association are Sciotoville soils and other minor soils. Emma soils make up about 35 percent of this association; Sexton soils, about 25 percent; Weinbach soils, about 20 percent; Sciotoville soils, about 15 percent; and other minor soils, about 5 percent.

Emma soils formed in silty clay loam sediment. They are closer to the Wabash and Ohio Rivers than the other soils in the association and occupy somewhat lower areas. The poorly drained Sexton soils are in nearly level to depressional areas, and the somewhat poorly drained Weinbach soils occupy nearly level to undulating areas. The Sexton and Weinbach soils formed in silty sediment.

Closely associated with the Sexton and Weinbach soils are the minor Sciotoville soils. Sciotoville soils are gently undulating to undulating and are in waterways and on narrow breaks. They have a fragipan that is weakly developed or is moderately developed. Other minor soils are undulating and are underlain by sand at a depth of less than 40 inches.

The dominant soils in this association are very strongly acid, are low in available phosphorus, and are low to medium in available potassium. Available moisture holding capacity is high. Permeability is slow to moderately slow in the Emma soils, slow in the Sexton and Weinbach soils, and moderately slow in the fragipan of the Sciotoville soils. Fertility is low in all of the soils. Frequent flooding, low position on the landscape, nearly level slopes, and slow movement of water into and through the soils are problems. Artificial drainage is needed, but tile drains are not suitable because of the slow permeability.

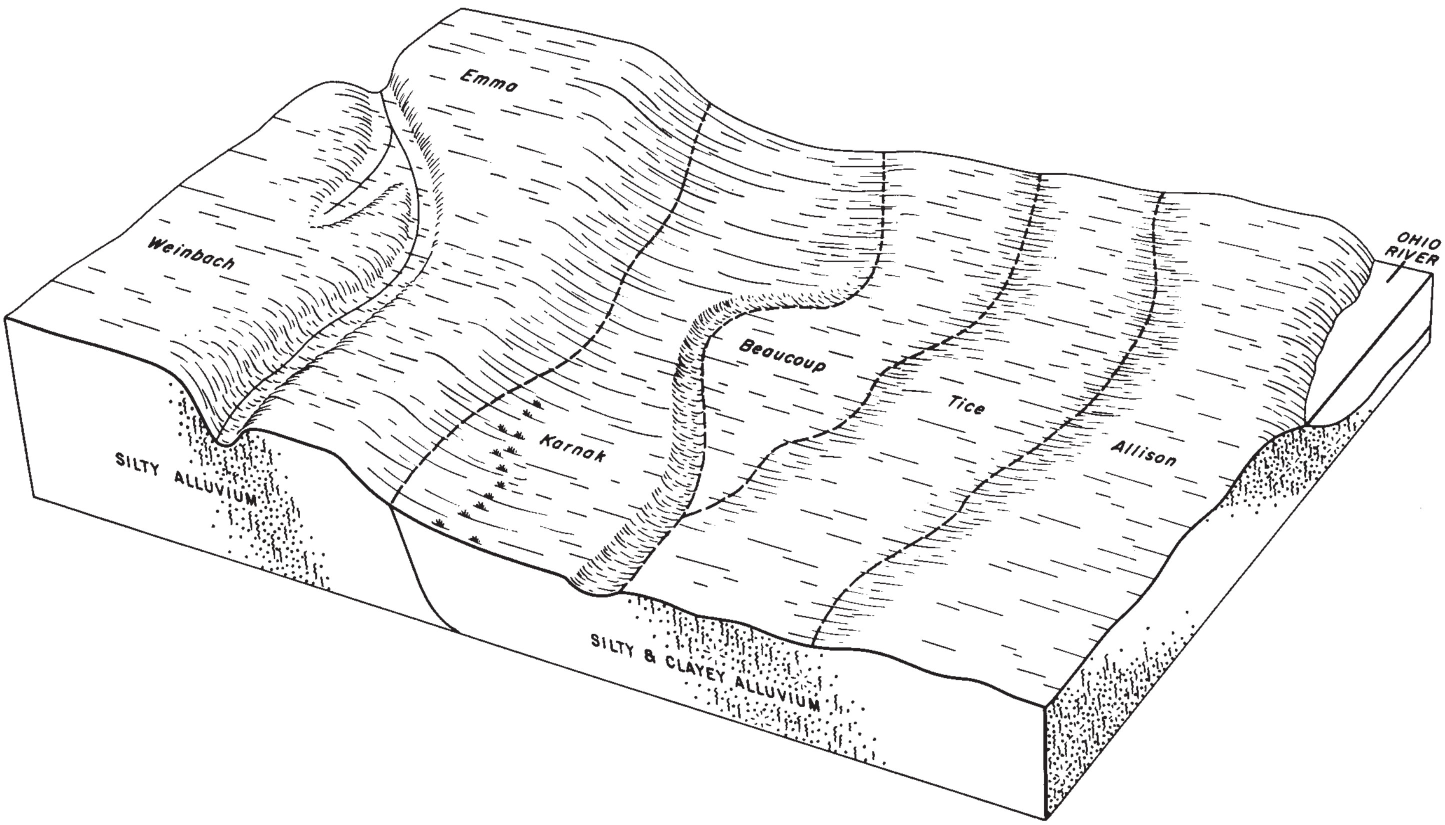

Figure 8.—**Major soil series in soil associations 8 and 9 and their relationship to the landscape.**

Many of the nearly level and undulating soils in this association were once wooded, but large areas are now being cleared. The trees consist of post oak, blackjack oak, and hickory and are of low value.

Most of the soils in this association are suited to farming, though they are not suited to intensive cropping unless good management is used. The sloping, narrow, and irregular areas on breaks to the bottom lands are better suited to pasture or trees than to row crops. In the past, this association consisted largely of wooded areas, which had small cleared fields scattered throughout. Under good management, which includes clearing the areas and applying fertilizer, farming is now more general.

9. Karnak-Allison-Wakeland Association

Deep, very slowly permeable to moderately permeable, nearly level, silty and clayey soils subject to annual flooding

This soil association is on flood plains of the Wabash, Ohio, and Saline Rivers and of the Bear, Cane, Eagle, and White Oak Creeks. The soils are deep and nearly level, but in many places flooding and the resulting changing of streambeds have caused sloughs to form. In and around the sloughs are very gently sloping to strongly sloping soils. The soils that formed in silty sediment are mainly along the Saline River and along Cane, Eagle, and White Oak Creeks; those that formed in silty clay loam sediment are mostly adjacent to the Wabash and Ohio Rivers; and those that formed in sediment of silty clay to clay are mainly in and around sloughs that are farthest from the Wabash and Ohio Rivers. Permeability is very slow to moderate. This soil association makes up about 27 percent of the county.

Dominant in this association are the Karnak, Allison, and Wakeland soils. Belknap, Birds, Bonnie, Dupo, Tice, and other minor soils are also in the association. Karnak soils make up about 25 percent of this association; Allison soils, about 20 percent; Wakeland soils, about 15 percent; and the minor soils, about 40 percent.

Karnak soils are nearly level and very gently sloping to strongly sloping and are adjacent to sloughs. They are light colored and are poorly drained. Allison soils are nearly level and are along the Wabash River and the upper part of the Ohio River. These soils are dark colored and are well drained. Wakeland soils are nearly level and are on flood plains of the Saline River and of Bear, Cane, and Eagle Creeks. These soils are light colored and are somewhat poorly drained. The minor Birds soils occupy depressional areas within areas of Wakeland soils.

The soils in this association vary, depending on the kind and the source of the sediment in which they formed and the frequency of flooding. In general, the soils all have high available moisture holding capacity. Fertility ranges from high to low, and permeability from very slow to moderate. The silty soils in the southern half of the county are not so acid as those in the northern half, and the Allison soils are neutral in reaction. Drainage and flooding are the main problems. The kind of drainage that can be provided depends on the permeability of the soil being considered for drainage. Little can be done about the flooding hazard, though a small area near Old Shawneetown is now protected by levees.

Many of the wooded areas along streambanks and sloughs are being cleared and put into cultivation. A few of these areas are large. Most of the woods were made up of black oak, post oak, and hickory trees. The trees in wooded areas along the Wabash and Ohio Rivers, however, consisted of pecan, cottonwood, sweetgum, and ash, and those in the areas farthest from the rivers were pin oak, black oak, cypress, and hickory. Only a few wooded areas now remain.

Except for the Karnak and similar soils, most soils in this association are suited to intensive farming. Under good management, which includes clearing the areas and applying large amounts of fertilizer, and particularly nitrogen, the areas are cropped intensively.

Descriptions of the Soils

This section describes the soil series and mapping units of Gallatin County in alphabetical order. The acreage and proportionate extent of each mapping unit are given in table 3. Their location in the county is shown on the detailed soil map at the back of this survey.

The procedure is first to describe the soil series, and then the mapping units in that series. Thus, to get full information on any mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs. Small areas of contrasting soils or of rocky, wet, or shallow areas and of other miscellaneous kinds of land are shown on the detailed soil map by special symbols.

In comparing the profile of a mapping unit with that described as typical for a soil series, many will prefer to read the short description in paragraph form. It precedes the technical description that identifies layers by A, B, and C horizons and depth ranges. The technical profile descriptions are mainly for soil scientists, engineers, and others who need to make a more thorough and precise study of the soils.

In describing the representative profile, the color of each horizon is described in words, such as yellowish brown, but it can also be indicated by symbols for the hue, value, and chroma, such as 10YR 5/4. These symbols, called Munsell color notations (*22*), are used by soil scientists to evaluate the color of the soil precisely. For the profiles described, the names of the colors and the color symbols are for moist soil unless stated otherwise.

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the management group and the woodland suitability group in which the mapping unit has been placed. The page on which each group is described can be found by referring to the "Guide to Mapping Units" at the back of this survey. Many terms in the soil descriptions and in other parts of the survey are defined in the Glossary.

TABLE 3.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Alford silt loam 1 to 4 percent slopes	1,920	0.9
Alford silt loam, 4 to 7 percent slopes, eroded	3,410	1.6
Alford soils, 4 to 7 percent slopes, severely eroded	610	.3
Alford silt loam, 7 to 12 percent slopes, eroded	2,370	1.1
Alford soils, 7 to 12 percent slopes, severely eroded	1,070	.5
Alford silt loam, 12 to 18 percent slopes, eroded	920	.4
Alford soils, 12 to 18 percent slopes, severely eroded	776	.4
Alford silt loam, 18 to 30 percent slopes, eroded	1,970	.9
Alford soils, 18 to 30 percent slopes, severely eroded	278	.1
Alford silt loam, 30 to 60 percent slopes	1,096	.5
Alford-Bold complex, 7 to 12 percent slopes, eroded	177	.1
Allison silty clay loam	9,666	4.7
Alvin fine sandy loam, 0 to 2 percent slopes	1,226	.6
Alvin fine sandy loam, 2 to 4 percent slopes	3,375	1.6
Alvin fine sandy loam, 4 to 10 percent slopes, eroded	1,672	.8
Alvin soils, 6 to 12 percent slopes, severely eroded	281	.1
Alvin fine sandy loam, 12 to 30 percent slopes, eroded	238	.1
Ava silt loam, 2 to 4 percent slopes	614	.3
Ava silt loam, 4 to 7 percent slopes	257	.1
Ava silt loam, 4 to 7 percent slopes, eroded	660	.3
Ava soils, 7 to 16 percent slopes, severely eroded	223	.1
Beaucoup silty clay loam	1,398	.7
Belknap silt loam	3,195	1.5
Birds silt loam	725	.3
Bloomfield fine sand, 1 to 12 percent slopes	524	.2
Bloomfield fine sand, 12 to 30 percent slopes	524	0.2
Bluford silt loam, 1 to 4 percent slopes	757	.4
Bluford silt loam, 4 to 7 percent slopes, eroded	180	.1
Bonnie silt loam	842	.4
Burnside silt loam	91	(1)
Camden silt loam, 0 to 2 percent slopes	566	.3
Camden silt loam, 2 to 4 percent slopes	1,422	.7
Camden silt loam, 4 to 10 percent slopes, eroded	664	.3
Camden soils, 4 to 7 percent slopes, severely eroded	197	.1
Camden soils, 7 to 20 percent slopes, severely eroded	282	.1
Creal silt loam, 1 to 5 percent slopes	406	.2
Darwin silty clay	2,997	1.4
Darwin silt loam, overwash	260	.1
Drury silt loam, 0 to 2 percent slopes	346	.2
Drury silt loam, 2 to 7 percent slopes	826	.6
Dupo silt loam	3,017	1.4
Emma silty clay loam, 0 to 2 percent slopes	3,452	1.6
Emma silty clay loam, 2 to 6 percent slopes	757	.4
Emma silty clay loam, 7 to 12 percent slopes, eroded	139	.1
Harco silt loam	1,579	.8
Harpster silty clay loam	315	.1
Haymond silt loam	1,222	.6
Hickory loam, 4 to 10 percent slopes, eroded	346	.2
Hickory soils, 7 to 12 percent slopes, severely eroded	414	.2
Hickory soils, 12 to 18 percent slopes, severely eroded	307	.1
Hickory loam, 18 to 30 percent slopes, eroded	149	.1
Hosmer silt loam, 1 to 4 percent slopes	2,008	1.0
Hosmer silt loam, 4 to 7 percent slopes	1,977	1.0

See footnote at end of table.

TABLE 3.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent
Hosmer silt loam, 4 to 7 percent slopes, eroded	3, 697	1. 8
Hosmer soils, 4 to 7 percent slopes, severely eroded	499	. 2
Hosmer silt loam, 7 to 12 percent slopes	810	. 4
Hosmer silt loam, 7 to 12 percent slopes, eroded	2, 511	1. 2
Hosmer soils, 7 to 12 percent slopes, severely eroded	1, 889	. 9
Hosmer silt loam, 12 to 18 percent slopes, eroded	328	. 2
Hosmer soils, 12 to 18 percent slopes, severely eroded	255	. 1
Iva silt loam, 1 to 4 percent slopes	305	. 1
Jules silt loam	420	. 2
Karnak silty clay	6, 917	3. 3
Karnak silty clay, wet	5, 571	2. 6
Lamont fine sandy loam, 1 to 4 percent slopes	783	. 4
Lamont fine sandy loam, 4 to 7 percent slopes	621	. 3
Lamont fine sandy loam, 7 to 12 percent slopes, eroded	395	. 2
Marissa silt loam	6, 993	3. 3
Markland silt loam, 1 to 4 percent slopes	553	. 3
Markland silt loam, 2 to 4 percent slopes, eroded	409	. 2
Markland silt loam, 4 to 7 percent slopes, eroded	626	. 3
Markland soils, 4 to 7 percent slopes, severely eroded	191	. 1
Markland silt loam, 7 to 12 percent slopes, eroded	525	. 2
Markland silt loam, 12 to 18 percent slopes	345	. 2
McGary silt loam, 0 to 2 percent slopes	4, 097	1. 9
McGary silt loam, 2 to 4 percent slopes	800	. 4
McGary silt loam, 2 to 4 percent slopes, eroded	481	. 2
McGary silt loam, 4 to 7 percent slopes, eroded	146	. 1
Montgomery silty clay	4, 063	1. 9
Montgomery silt loam, overwash	654	. 3
Okaw silt loam	916	. 4
Onarga fine sandy loam, 1 to 4 percent slopes	301	. 1
Onarga fine sandy loam, 4 to 10 percent slopes	126	. 1
Patton silty clay loam	14, 279	6. 9
Petrolia silty clay loam	867	. 4
Piopolis silty clay loam	1, 675	. 8
Plano silt loam, 0 to 2 percent slopes	443	. 2
Plano silt loam, 2 to 4 percent slopes	111	. 1
Racoon silt loam	189	. 1
Reesville silt loam, 0 to 2 percent slopes	13, 383	6. 5
Reesville silt loam, 2 to 4 percent slopes	3, 949	1. 9
Reesville silt loam, 2 to 4 percent slopes, eroded	718	. 3
Reesville silt loam, 4 to 7 percent slopes, eroded	360	. 2
Reesville soils, 4 to 7 percent slopes, severely eroded	205	. 1
Roby fine sandy loam, 0 to 2 percent slopes	3, 095	1. 5
Roby fine sandy loam, 2 to 7 percent slopes	638	. 3
Ruark fine sandy loam	2, 409	1. 1
Sarpy sand	210	. 1
Sawmill silty clay loam	456	. 2
Sciotoville silt loam, 0 to 2 percent slopes	385	. 2
Sciotoville silt loam, 2 to 4 percent slopes	663	0. 3
Sciotoville silt loam, 4 to 7 percent slopes, eroded	670	. 3
Sciotoville silt loam, 7 to 12 percent slopes, eroded	357	. 2
Sciotoville silt loam, 12 to 25 percent slopes, eroded	124	. 1
Sexton silt loam	6, 267	2. 9
Shiloh silty clay	1, 338	. 6
Starks silt loam, 0 to 2 percent slopes	1, 512	. 7
Starks silt loam, 2 to 6 percent slopes	595	. 3
Stoy silt loam, 0 to 2 percent slopes	195	. 1
Stoy silt loam, 2 to 4 percent slopes	487	. 2
Tice silty clay loam	5, 898	2. 8
Uniontown silt loam, 0 to 2 percent slopes	1, 204	. 6
Uniontown silt loam, 2 to 4 percent slopes	4, 033	1. 9
Uniontown silt loam, 4 to 7 percent slopes, eroded	2, 182	1. 0
Uniontown soils, 4 to 7 percent slopes, severely eroded	829	. 4
Uniontown silt loam, 7 to 16 percent slopes, eroded	419	. 2
Uniontown soils, 10 to 25 percent slopes, severely eroded	580	. 3
Wabash silty clay	917	. 4
Wakeland silt loam	8, 298	3. 9
Wallkill silty clay loam, wet	889	. 4
Weinbach silt loam, 0 to 2 percent slopes	1, 569	. 7
Weinbach silt loam, 2 to 4 percent slopes	594	. 3
Wellston silt loam, 5 to 12 percent slopes, eroded	226	. 1
Wellston silt loam, 12 to 18 percent slopes, eroded	1, 197	. 6
Wellston soils, 12 to 18 percent slopes, severely eroded	801	. 4
Wellston silt loam, 18 to 30 percent slopes, eroded	230	. 1
Wellston-Berks complex, 12 to 60 percent slopes, eroded	8, 870	4. 3
Worthen silt loam	988	. 5
Wynoose and Weir silt loams	247	. 1
Zanesville silt loam, 3 to 12 percent slopes, eroded	200	. 1
Zanesville silt loam, 12 to 18 percent slopes, eroded	742	. 4
Zanesville soils, 12 to 18 percent slopes, severely eroded	606	. 3
Zanesville silt loam, 18 to 30 percent slopes, eroded	135	. 1
Areas identified on detailed map by spot symbols:		
Borrow pit	219	. 1
Strip mine	344	. 2
Mine dump	4	(1)
Sand quarry	5	(1)
Gravel pit	57	(1)
Made land	3	(1)
Water	878	. 4
Total	209, 664	100. 0

[1]Less than 0.05 percent.

Alford Series

In the Alford series are deep, gently sloping to steep, light-colored soils that are moderately well drained or well drained. These soils are in the uplands along the eastern side of the county. They formed in silty windblown material, or loess, generally more than 7 feet thick. The original vegetation was a hardwood forest consisting of yellow-poplar, oak, maple, and hickory.

In a typical profile the surface layer is dark grayish-brown silt loam 7 inches thick. It overlies a thick layer of brown silty clay loam that has subangular blocky structure.

These soils have high available moisture capacity and are moderately permeable. They are strongly acid to medium acid, are low in available phosphorus, and are medium to high in available potassium.

Representative profile of an Alford silt loam on a slope of about 3 percent on the east side of a private road (NE40, SW160, sec. 33, T. 9 S., R. 9 E.):

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

B21t—7 to 16 inches, brown (7.5YR 4/4) light silty clay loam; strong, fine, subangular blocky structure; firm; moderately thick, continuous, reddish-brown (5YR 4/4) clay films; medium acid; gradual, smooth boundary.

B22t—16 to 24 inches, brown (7.5YR 4/4) medium silty clay loam; strong, fine, subangular blocky structure; firm; thick, continuous, reddish-brown (5YR 4/4) clay films; strongly acid; gradual, smooth boundary.

B23t—24 to 29 inches, brown (7.5YR 4/4) medium silty clay loam; strong, medium and fine, subangular blocky structure; firm; thick, continuous, reddish-brown (5YR 4/4) clay films; strongly acid; gradual, smooth boundary.

B24t—29 to 36 inches, brown (7.5YR 4/4) silty clay loam; strong, medium, subangular blocky structure; firm; moderately thick reddish-brown (5YR 4/4) clay films; strongly acid; gradual, smooth boundary.

B31—36 to 43 inches, brown (7.5YR 4/4) light silty clay loam; moderate, medium, subangular blocky structure; firm; moderately thick reddish-brown (5YR 4/4) clay films; medium acid; gradual, smooth boundary.

B32—43 to 51 inches, brown (7.5YR 4/4) silt loam; weak, coarse, subangular blocky structure; friable; a few brown (7.5YR 4/2) clay films; medium acid to slightly acid; clear, smooth boundary.

C1—51 to 62 inches, brown (7.5YR 4/4) silt loam; massive; friable; slightly acid; gradual, smooth boundary.

C2—62 inches +, calcareous silty loess.

The surface layer is silt loam where uneroded and silty clay loam where severely eroded. It ranges from less than 1 inch to 14 inches in thickness and from dark grayish brown to dark brown or brown in color. The B horizon ranges from 35 inches to about 50 inches in thickness.

Alford soils are permeable throughout and lack the fragipan typical of Hosmer soils. They are better drained than Iva soils, and unlike them, are free of mottles in the upper part of the subsoil.

Alford silt loam, 1 to 4 percent slopes (308B).—This soil has the profile described for the series. It occupies ridgetops, which range from 200 to 500 feet in width, and other fairly broad areas in the uplands. The areas generally are above more strongly sloping Alford soils, but in the northeastern part of the county, they are below the nearly level, somewhat poorly drained Iva soils. The surface layer is dark grayish brown and ranges from 6 to 14 inches in thickness. Erosion is a hazard.

Included with this soil are small areas of gently sloping Alford soils and of nearly level, somewhat poorly drained Iva soils. Also included are some areas of moderately eroded soils that have a grayish-brown to brown surface layer. These moderately eroded soils contain less organic matter than this soil, and they tend to crust readily.

Under good management, which includes adding lime and fertilizer, this Alford soil is suited to all crops commonly grown in the county. Growing grasses and legumes in the cropping systems, returning all crop residues to the soil, and keeping tillage to a minimum are ways of controlling erosion. Management group IIe–2; woodland suitability group 5.

Alford silt loam, 4 to 7 percent slopes, eroded (308C2).—This soil occupies fairly narrow areas in and around waterways that extend into areas of less sloping Alford soils. The areas lie between the less eroded Alford soils on similar slopes and the strongly sloping Alford soils.

All except 3 to 7 inches of the original surface layer of this soil has been eroded away. As a result, the present surface layer is brown, contains less organic matter than the original one, and is in poorer tilth. In addition runoff and the hazard of further erosion are greater, and less water moves into the soil and is held available for crops. In some places material formerly in the subsoil has been mixed with the remaining surface soil by plowing, and here the content of clay is greater than in less eroded areas. In most places the present surface layer erodes more readily than the original one and crusts readily after a rainstorm. In some areas, however, more than 7 inches of the original surface layer remains and soil crusting is less of a problem.

Included with this soil are some areas of Alford soils that have similar slopes but are either less eroded or are severely eroded. Also included are small areas of more strongly sloping Alford soils and of an Alford soil that has a subsoil of silt loam. Other included areas consist of soils that are sandy and calcareous.

If erosion is controlled, water loss reduced, and tilth improved, this Alford soil is suited to all cultivated crops and grain crops commonly grown in the county. Hay and pasture crops also grow well. Practices needed are farming on the contour, terracing, growing grasses and legumes in the cropping system, and returning all crop residues to the soil. In addition tillage must be kept to a minimum, and lime and fertilizer must be applied. Management group IIe–2; woodland suitability group 5.

Alford soils, 4 to 7 percent slopes, severely eroded (308C3).—Areas of these soils are fairly narrow and are in waterways that extend into areas of less sloping Alford soils. The areas lie between the less eroded Alford soils on similar slopes and the more strongly sloping Alford soils.

Most, and in some places all, of the original surface layer of these soils has been eroded away. The present surface layer is brown and is less than 3 inches thick. It contains more clay than that in the profile described for the series. Consequently, runoff and the hazard of further erosion are greater, preparing a seedbed is more difficult, and less water moves into the soil and is held available for crops.

Included with these soils are some areas of other Alford soils. Also included are small areas that are cut by many deep gullies that cannot be crossed with farm machinery. In some other included areas, the subsoil is silt loam or loam and is calcareous.

If erosion is controlled, water loss reduced, and tilth improved, these Alford soils are suited to all cultivated crops and grain crops commonly grown in the county. Hay and pasture crops also grow well. Farming on the contour, using terraces and diversions, growing grasses and legumes in the cropping system, and returning all crop residues to the soils are practices needed. In addition tillage must be kept to a minimum and lime and fertilizer applied. Management group IIIe–3; woodland suitability group 5.

Alford silt loam, 7 to 12 percent slopes, eroded (308D2).—This soil is in waterways and on simple, slightly convex slopes. The areas generally are below gently sloping Alford soils and above nearly level Wakeland soils or less sloping Alford soils.

Much of the original surface layer of this soil has been removed through erosion. The present surface layer is brown and is 3 to 7 inches thick. It is lower in organic matter than the original surface layer, is in poorer tilth, and erodes more readily. It also crusts readily after a rainstorm. In areas under trees and on ridgetops, where the surface layer is more than 7 inches thick, crusting is less likely and water moves into the soil more readily. In some places material formerly in the subsoil has been mixed with the remaining surface layer by plowing. Here the surface layer contains more clay than that in the profile described for the series.

Included with this soil are small areas of Alford soils on similar slopes that are less eroded or are severely eroded. Also included are some areas of other Alford soils.

If erosion is controlled, water loss reduced, and tilth improved, this Alford soil is suited to all cultivated crops and grain crops grown in the county. Hay and pasture crops also grow well. Farming on the contour, terracing, growing grasses and legumes in the cropping system, and returning all crop residues to the soil are practices needed. In addition tillage must be kept to a minimum and lime and fertilizer applied. Management group IIIe–3; woodland suitability group 5.

Alford soils, 7 to 12 percent slopes, severely eroded (308D3).—These soils occupy narrow areas in and around waterways that extend into areas of gently sloping Alford soils. The areas are below gently sloping, less eroded Alford soils and above nearly level, somewhat poorly drained Wakeland soils.

Most, and in some places all, of the original surface layer of these soils has been eroded away. The present surface layer ranges from silt loam to silty clay loam in texture. It is brown, is less than 3 inches thick, and contains more clay than that in the profile described for the series. In addition runoff and the hazard of further erosion are greater, less water moves into the soil and is held available for crops, and preparing a seedbed is difficult.

Included with these soils are small areas of other Alford soils. Also included are some areas of a soil that has a less clayey surface layer than these soils, that has a subsoil of silt loam, and that is calcareous within a depth of 24 inches. Other small included areas are cut by many deep gullies that cannot be crossed with farm machinery.

If erosion is controlled, water loss is reduced, and tilth is improved, these Alford soils are suited to limited use for row crops. They are also suited to the grain crops commonly grown, and to hay and pasture. Farming on the contour, use of terraces and diversions, growing grasses and legumes in the cropping system, and returning all crop residues to the soils are practices needed. In addition tillage must be kept to a minimum and lime and fertilizer applied. Management group IVe–2; woodland suitability group 5.

Alford silt loam, 12 to 18 percent slopes, eroded (308E2).—This soil occupies narrow areas in waterways that extend into areas of less sloping Alford soils. The areas lie below other Alford soils and above the nearly level, somewhat poorly drained Wakeland soils.

All but between 3 and 7 inches of the original surface layer of this soil has been removed through erosion. The present surface layer is brown, contains less organic matter than the original one, is more erodible, and is in poorer tilth. It also crusts readily after a rainstorm. In some places material formerly in the subsoil has been mixed with the remaining surface layer by plowing. Here the content of clay is greater than that in the surface layer of the profile described for the series.

Included with this soil are some areas of Alford soils that have more than 7 inches of original surface soil remaining. Also included are some areas of other soils that have a slightly acid to calcareous surface layer. Other included areas, too small to be mapped separately, have a surface layer that is sandy and calcareous or they consist of more strongly sloping Alford soils.

This Alford soil is suited to all crops commonly grown in the county if erosion is controlled, water loss is reduced, and tilth is improved. Nevertheless, it probably is better suited to limited use for grain, hay, and pasture (fig. 9) than it is to row crops. Farming on the contour, use of diversions, growing grasses and legumes in the cropping system most of the time, and returning all crop residues to the soil are practices needed. In addition tillage must be kept to a minimum and lime and fertilizer applied. Management group IVe–2; woodland group 5.

Alford soils, 12 to 18 percent slopes, severely eroded (308E3).—These soils are in and around waterways that extend into less sloping areas of Alford soils. The areas are narrow and lie below other Alford soils or are above the nearly level, somewhat poorly drained Wakeland soils.

Figure 9.—**Pasture on Alford silt loam, 12 to 18 percent slopes, eroded.**

Most, and in many places all, of the original surface layer of these soils has been removed by erosion. The present surface layer ranges from silt loam to silty clay loam in texture. It is brown and is less than 3 inches thick. It contains more clay than the surface layer in the profile described for the series. As a result, preparing a seedbed is more difficult, runoff and erosion are greater, and less water moves into the soil and is held available for crops.

Included with these soils are some less clayey soils that have a weakly developed subsoil consisting of silt loam. These included soils are friable and permeable and are neutral to calcareous. Other included small areas consist of other Alford soils and of soils that are cut by deep gullies. The gullies extend downward into the permeable, silty substratum and cannot be crossed with farm machinery.

Strong slopes and severe erosion make these Alford soils better suited to the growing of hay and pasture crops than to row crops. If adequate amounts of lime and fertilizer are applied, a good cover of legumes and grasses can be kept on the areas and further erosion controlled. Management group VIe–1; woodland suitability group 5.

Alford silt loam, 18 to 30 percent slopes, eroded (308F2).—Areas of this soil are in and around waterways, on narrow ridges, and on fairly long simple slopes. The areas lie below less sloping Alford soils and above somewhat poorly drained areas of nearly level Wakeland soils or of very gently sloping Burnside soils that are shallow to bedrock.

All but 3 to 7 inches of the original surface layer of this soil has been removed through erosion. The present surface layer is brown and is lower in organic matter than the original one. It also crusts readily after a rainstorm.

Included with this soil are some areas that have more than 7 inches of surface soil remaining. Also included are some areas of a soil that is calcareous at a depth of less than 30 inches and that has a subsoil consisting of friable and permeable silt loam. A few small included areas have a sandy surface layer. Other included areas consist of less sloping Alford soils.

Most areas of this Alford soil formerly were in trees, but because of overcutting and pasturing, the areas are now mostly idle. This soil probably is better suited to trees and pasture than to other uses. If the areas are farmed, erosion can be controlled by keeping a good stand of grasses and legumes on the areas. Growth of pasture plants is fair to good if lime and fertilizer are applied. Management group VIe–1; woodland suitability group 5.

Alford soils, 18 to 30 percent slopes, severely eroded (308F3).—These soils are in and around waterways. Slopes are moderately steep and fairly long and simple. The areas are below less sloping Alford soils and above somewhat poorly drained areas of nearly level Wakeland soils or of very gently sloping Burnside soils that are shallow to rock.

Most, and in many places all, of the original surface layer of these soils has been eroded away. In extremely eroded areas the subsoil is exposed. The present surface layer ranges from fine sandy loam to silty clay loam in texture. It is brown and is less than 3 inches thick. It contains more clay than the surface layer in the profile described for the series. Consequently runoff and the hazard of further erosion are greater, and less water moves into the soil and is held available for crops.

Included with these soils are small areas of other Alford soils and some areas of a soil that is neutral to calcareous and has a subsoil of friable and permeable silt loam. Also included are some small areas of a sandy soil that is calcareous and some areas of the calcareous, silty Bold soils. Other included areas are cut by deep gullies that extend downward into the permeable, silty substratum. These gullies cannot be crossed with farm machinery.

Most areas of these Alford soils are idle and have a cover of shrubs and sprouts. Because of the moderately steep slopes and severe erosion, these soils probably are better suited to trees or pasture than to other uses. Keeping a good stand of grasses and legumes on the soils or replanting to trees are ways of controlling erosion. Growth of pasture plants is fair if lime and fertilizer are applied. Management group VIe–1; woodland suitability group 5.

Alford silt loam, 30 to 60 percent slopes (308G).—This soil occupies steep slopes along waterways or along narrow bottom lands. Slopes are complex. The areas are below less sloping Alford soils and above the somewhat poorly drained, nearly level Dupo and Wakeland soils.

The surface layer of this soil ranges from dark grayish brown to brown and is about 10 inches thick. The subsoil is about 36 inches thick.

Included with this soil are small areas of other Alford soils and some areas of a soil that has a subsoil consisting of friable and permeable silt loam. Also included are some areas in which the surface layer is less than 3 inches thick. Other included areas consist of severely eroded soils in which the calcareous, silty substratum is exposed.

This Alford soil is better suited to trees than to other uses, and most areas are in trees. Because of the steep slopes, care is needed if farm equipment is used. Management group VIIe–1; woodland suitability group 5.

Alford-Bold complex, 7 to 12 percent slopes, eroded (985D2).—This mapping unit consists of Alford and Bold soils that occur in small areas in such a complex pattern that they cannot be mapped separately. The areas are in waterways having simple slopes that are slightly convex at the upper part and are concave at the middle and lower parts. The Alford soil occupies the upper part of the slopes, and the Bold soils, the middle and lower parts. Areas of this complex generally are below gently sloping Alford soils and above somewhat poorly drained Wakeland soils or gently sloping Drury soils.

The surface layer of the Alford soil is brown, and that of the Bold soil is brown to yellowish brown and is calcareous. Much of the original surface layer of the Alford soil has been eroded away. The present surface layer contains less organic matter and is in poorer tilth than the original one, and it therefore erodes more readily. Further erosion is a hazard.

Included with this complex are small areas of gently sloping and severely eroded Alford soils. Also included are some areas of soils that have a thin, noncalcareous surface layer and a subsoil of silt loam.

If erosion is controlled, water loss reduced, and tilth improved, the soils in this complex are suited to all cultivated crops and grain crops commonly grown in the county. Hay and pasture also grow well. Contour farming, terracing, growing grasses and legumes in the cropping system, and returning all crop residues to the soils are practices needed. In addition tillage must be kept to a minimum and lime and fertilizer applied. Control of johnsongrass is a serious problem on the Bold soil in this complex. Management group IIIe–3; woodland suitability group 5.

Allison Series

The Allison soils are deep, nearly level to very gently sloping, moderately dark colored, and well drained. They are on bottom lands along the Wabash River. These soils are formed in 40 or more inches of silty clay loam material. The original vegetation was a forest consisting of maple, oak, elm, sycamore, cottonwood, poplar, ash, pecan, and willow.

The surface layer, a very dark grayish brown silty clay loam, is about 17 inches thick. It overlies a thick layer of blocky silty clay loam that is very dark grayish brown in the upper part, but becomes brown with depth.

Allison soils have very high available moisture capacity and are moderately permeable. They generally are slightly acid to neutral, are medium in available phosphorus and nitrogen, and are high in available potassium.

Representative profile of Allison silty clay loam on a slope of about 1 percent (SW2½, NW10, SE40, NE160, sec. 25, T. 8 S., R. 10 E.):

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silty clay loam; cloddy, but breaks to weak, fine and medium, granular structure; firm; neutral; abrupt, smooth boundary.

A3—8 to 17 inches, very dark grayish-brown (10YR 3/2) silty clay loam; weak, medium and fine, subangular blocky structure; firm; continuous very dark gray (10YR 3/1) to very dark grayish-brown (10YR 3/2) coatings; abundant roots; neutral; diffuse, smooth boundary.

B21—17 to 35 inches, very dark grayish-brown (10YR 3/2) to dark-brown (10YR 3/3) silty clay loam; weak, medium and coarse, subangular blocky structure that tends toward prismatic; firm; very dark grayish-brown (10YR 3/2) coatings and worm casts; neutral; diffuse, smooth boundary.

B22—35 to 50 inches, dark-brown (10YR 3/3 to 10YR 4/3) silty clay loam; weak, coarse and medium, blocky structure that tends toward prismatic; firm; dark grayish-brown (10YR 4/2) to very dark grayish-brown (10YR 3/2) coatings; neutral; diffuse, smooth boundary.

B23—50 to 60 inches, brown (10YR 4/3) silty clay loam; weak, coarse, prismatic structure that breaks to weak, medium, subangular blocky; firm; some dark-brown (10YR 3/3) coatings; neutral; diffuse, smooth boundary.

BC—60 to 70 inches, brown (10YR 4/3) silty clay loam; very weak, coarse, prismatic structure (almost massive) that breaks to very weak, subangular blocky; firm; a few dark grayish-brown to dark-brown (10YR 4/2 to 10YR 3/3) coatings; neutral.

In color the surface layer and upper part of the subsoil range from very dark grayish brown to dark brown. Thickness of the solum ranges from 40 to 90 inches. Reaction ranges from slightly acid to mildly alkaline. Below a depth of 40 inches, the texture ranges from silty clay loam to loamy sand.

The Allison soils are similar to the Tice soils but are free of mottles to a depth of 40 inches. The Tice soils generally are mottled at a depth of 20 inches.

Allison silty clay loam (306).—This is the only Allison soil mapped in the county. It generally is nearly level and is on broad bottom lands along the Wabash River, but some areas adjacent to sloughs have slopes of as much as 10 percent and are long and narrow. The areas range from about 5 to 100 acres or more in size. They generally are broader and slightly more elevated than areas of the more poorly drained Tice, Petrolia, and Beaucoup soils.

Included with this soil are small areas of the somewhat poorly drained Tice soils and of the moderately well drained Emma soils.

This Allison soil is suited to intensive cropping, but because of frequent flooding early in spring, it is restricted to summer crops. The plow layer is likely to become dense and compact unless tillage is done at the proper time, all crop residues are returned to the soil, and other good management is used. Johnsongrass and wild cane are a serious problem because of the frequent flooding. Crops on this soil respond well if nitrogen is applied and if phosphorus and potash are applied as needed. Lime generally is not needed. Management group IIw–6; woodland suitability group 9.

Alvin Series

In the Alvin series are deep, nearly level to moderately steep, light-colored soils that are moderately well drained or well drained. Some of these soils are in sandy areas in the eastern part of the county, and others are on sandy knolls on broad, level terraces in the north-central part of the county. Alvin soils formed in sandy material under tulip-poplar, white oak, and walnut trees.

The surface layer generally is brown to dark-brown fine to very fine sandy loam about 17 inches thick. It overlies a thick layer of brown to dark-brown sandy loam that has subangular blocky structure.

Alvin soils have moderate available moisture capacity. Permeability generally is moderate, but it is moderately rapid in some places. These soils generally are medium acid to slightly acid in the upper 60 inches, but at a depth of less than 100 inches they are calcareous. They are low in available phosphorus and potassium.

Representative profile of an Alvin fine sandy loam on a slope of about 2 percent on a low knoll in a cultivated field, 5 rods east of the center of a gravel road and 33 rods north of the section line, or the corner of the road (SW10, SW40, SE160, sec. 5, R. 9 E., T. 9 S.):

Ap—0 to 9 inches, brown to dark-brown (10YR 4/3) fine to very fine sandy loam; very friable; breaks to irregular fragments; contains a few lumps of material from the A2 horizon; a few corn roots; slightly acid; abrupt, smooth boundary.

A2—9 to 17 inches, brown (7.5YR 5/4) to dark-brown (7.5YR 4/4) fine to very fine sandy loam; very weak, coarse, granular structure; friable; a few, very dark brown (10YR 2/2) specks of iron and manganese; some stains of iron and manganese along root channels; a few corn roots; a few worm channels, some of which are filled with material from the Ap horizon; very strongly acid; clear, smooth boundary.

B1—17 to 22 inches, brown to dark-brown (7.5YR 4/4) sandy loam; a few, fine, faint, yellowish-brown (10YR 5/4) mottles; very weak, coarse, subangular blocky structure; friable; very light colored coatings of yellow silica flour; some corn roots; a few small wormholes; many very small vesicles; medium acid; clear, smooth boundary.

B21t—22 to 29 inches, brown to dark-brown (7.5YR 4/4) sandy loam; a few, medium, faint, yellowish-brown (10YR 5/4) mottles; some black (10YR 2/1) specks and stains of iron and manganese; weak to very weak, coarse, subangular blocky structure; slightly firm; some corn roots and worm channels; medium acid; gradual, smooth boundary.

B22t—29 to 38 inches, brown to dark-brown (7.5YR 4/4) sandy loam; some light yellowish-brown (10YR 6/4) to yellowish-brown (10YR 5/4) channel fillings; weak, coarse, angular blocky structure that breaks to weak, coarse, subangular blocky; firm; a few fine corn roots and worm channels; medium acid; gradual, smooth boundary.

B23t—38 to 43 inches, brown to dark-brown (7.5YR 4/4) sandy loam; common, coarse, light yellowish-brown (10YR 6/4) to yellowish-brown (10YR 5/4) mottles; weak, coarse, angular blocky structure; friable to firm; a few corn roots; a few fine worm channels; medium acid to slightly acid; clear, smooth boundary.

B3—43 to 48 inches, brown to dark-brown (7.5YR 4/4) sandy loam; common, coarse, light yellowish-brown (10YR 6/4) to yellowish-brown (10YR 5/4) mottles; very weak, coarse, angular blocky structure; friable; a few fine worm channels; medium acid to slightly acid; clear, smooth boundary.

C1—48 to 62 inches, mixed brown to dark-brown (7.5YR 4/4) and light yellowish-brown (10YR 6/4) to yellowish-brown (10YR 5/4) sandy loam; massive; friable; some stratification in lower part; a few wormholes; slightly acid; abrupt, smooth boundary.

C2—62 to 78 inches, light yellowish-brown (10YR 6/4) to yellowish-brown (10YR 5/4) sand; single grain; loose; neutral; abrupt, smooth boundary.

C3—78 to 100 inches, light yellowish-brown (10YR 6/4) sand; single grain; loose; calcareous.

In color, the surface layer ranges from dark brown to yellowish brown. Reaction ranges from very strongly acid to neutral. The subsoil ranges from 15 to 32 inches in thickness and from sandy loam to loam in texture. Depth to sand ranges from about 3 feet to more than 5 feet.

Alvin soils are similar to the Lamont soils but have more clay in the subsoil. They are at a higher elevation and are more sloping than the nearby somewhat poorly drained Roby soils and the poorly drained Ruark soils.

Alvin fine sandy loam, 0 to 2 percent slopes (131A).—This soil has the profile described for the series. It generally is on low knolls surrounded by somewhat poorly drained Roby soils, but some areas are on ridgetops near sloping Lamont soils.

Included with this soil are small areas of the somewhat poorly drained Roby fine sandy loams. Also included are some areas of the well-drained Camden silt loams.

Under good management, which includes adding lime and fertilizer, and later supplemental nitrogen as needed, this Alvin soil is suited to all crops commonly grown in the county. The moderate available moisture capacity makes the soil somewhat droughty. Including grasses and legumes in the cropping system, growing green-manure crops, and returning all crop residues to the soil are ways of increasing the ability of the soil to hold more water for plants. Management group IIs–1; woodland suitability group 8.

Alvin fine sandy loam, 2 to 4 percent slopes (131B).—Some areas of this soil are on low knolls within level areas of the lower lying Camden soils. Other areas are on ridgetops within larger areas of gently sloping to sloping Alvin soils.

The surface layer of this soil is thinner in some small areas, but the profile otherwise is similar to the one described for the series. In these small areas much of the original surface layer has been lost through erosion. As a result, here the present plow layer is yellowish brown to dark yellowish brown, contains less organic matter than the original one, and crusts more readily. In addition runoff is greater and less water moves into the soil and is held available for crops.

Included with this soil are some small areas of silty Camden soils and of silty Uniontown soils. Also included are small areas of sandy, somewhat poorly drained Roby soils.

This Alvin soil is suited to all crops commonly grown in the county, though the slight erosion hazard and moderate available moisture capacity slightly restrict use. Including grasses and legumes in the cropping system, growing green-manure crops, and returning all crop residues to the soil are ways of controlling erosion and conserving moisture. Lime and fertilizer also are needed. Management group IIe–4; woodland suitability group 8.

Alvin fine sandy loam, 4 to 10 percent slopes, eroded (131C2).—In some places this soil is on knolls surrounded by areas of very gently sloping Alvin soils. In other places it is on breaks below well-drained, silty Camden soils or somewhat poorly drained Roby soils. The areas on the breaks also are above the poorly drained, light-colored Sexton silt loam and the dark-colored, somewhat poorly drained Harco and Marissa soils.

The plow layer is brown to dark yellowish brown in color and is somewhat finer textured than that in the profile described for the series. Also, the subsoil, which is about 20 inches thick, is thinner. Much of the original surface layer of this soil has been removed through erosion, and material from the subsoil has been mixed into the remaining surface layer by plowing. The present surface layer is lower in organic matter than the original one and crusts more readily. In addition, runoff is greater and less water moves into the soil and is held available for crops.

Included with this soil are small areas of coarser textured Lamont soils and of silty Camden soils. Also included are some areas of Alvin soils that are either slightly eroded or are severely eroded.

Under good management, which includes adding lime and fertilizer, and then supplemental nitrogen as needed, this Alvin soil is moderately well suited to cultivated crops. It also is well suited to very well suited to hay and pasture crops. If this soil is cultivated, it is subject to further erosion. Farming on the contour, using terraces and diversions, and growing grasses and legumes in the cropping system much of the time are ways of controlling erosion and conserving moisture. In addition all crop residues must be returned to the soil. Management group IIIe–2; woodland suitability group 8.

Alvin soils, 6 to 12 percent slopes, severely eroded (131D3).—These soils are on breaks below gently sloping Alvin soils or coarser textured Lamont soils. The areas also are above nearly level to very gently sloping, sandy Roby soils or nearly level Wakeland silt loam, all of which are somewhat poorly drained.

The plow layer is brown and is somewhat finer textured than that in the profile described for the series. Most of the original surface layer has been lost through erosion, and material from the subsoil has been mixed into the remaining surface layer by plowing. The present surface layer ranges from fine sandy loam to sandy loam. It is lower in organic matter and crusts more readily than that in less eroded Alvin soils. In addition runoff is greater and less water is available for plants.

Included with this mapping unit are small areas of coarser textured Lamont soils. Also included are small areas of moderately eroded Alvin soils.

If lime and fertilizer are added and if supplemental nitrogen is applied as needed, these Alvin soils are well suited to hay and pasture crops. They also are fairly well suited to the cultivated crops commonly grown in the county. When cultivated, these soils are subject to further erosion. Farming on the contour, using terraces and diversions, and growing grasses and legumes in the cropping system much of the time are ways of conserving moisture and controlling erosion. In addition all crop residues must be returned to the soils. Management group IVe–1; woodland suitability group 8.

Alvin fine sandy loam, 12 to 30 percent slopes, eroded (131E2).—This soil is on breaks below sloping Alvin soils or coarser textured Lamont soils. It also is above nearly level or very gently sloping, sandy Roby soils or Wakeland silt loam, all of which are somewhat poorly drained. Areas of this soil are small and generally are long and narrow.

The plow layer is yellowish brown to dark yellowish brown. The subsoil, which is about 16 inches thick, is thinner than that in the profile described for the series. Much of the original surface layer has been lost through erosion. The present surface layer is lower in organic matter than is the corresponding layer of the less eroded Alvin soils, and crusts more readily. Also, runoff is greater and less water moves into the soil and is held available for crops.

Included with this soil are small areas of coarser textured Lamont soils. Also included are small areas of severely eroded Alvin soils.

This Alvin soil is better suited to hay, pasture, and woodland than to other uses, and most areas are in woods and pasture. If lime and fertilizer are applied, this soil is well suited to hay and pasture and moderately well suited to the common cultivated crops. The soil is subject to severe erosion when cultivated. Growing grasses and legumes in the cropping system much of the time and returning all crop residues to the soil are ways of controlling erosion. Management group IVe–1; woodland suitability group 8.

Ava Series

In the Ava series are very gently sloping to sloping, light-colored, moderately well drained soils that have a fragipan. These soils are on ridgetops and slopes in undulating areas in the northwestern part of the county. They formed under oak and hickory trees in silty windblown material, or loess, that was 20 to 50 inches thick over loam to clay loam glacial till of Illinoian age.

In most places the surface layer is about 8 inches thick. The upper part consists of dark yellowish-brown, granular silt loam, and the lower part is yellowish-brown, platy silt loam. Just below is silty clay loam that has blocky structure. It is brown to dark brown in the upper part and yellowish brown in the lower part. The fragipan is at a depth of about 25 inches.

These soils have moderate available moisture holding capacity. Permeability is moderate to moderately slow above the fragipan and slow in the fragipan. Ava soils generally are very strongly acid, are very low in available phosphorus, and are medium in available potassium.

Representative profile of an Ava silt loam on a slope of about 5 percent, 150 feet east of a farm lane and 50 feet north of the road (SE10, NE40, SW160, sec. 21, T. 7 S., R. 8 E.):

A1&A2—0 to 5 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; friable; very strongly acid; clear, smooth boundary.

A2—5 to 8 inches, yellowish-brown (10YR 5/4) silt loam; weak, thin, platy structure that breaks to weak, fine and medium, granular; friable; very strongly acid; abrupt, smooth boundary.

B1—8 to 12 inches, brown to dark-brown (7.5YR 4/4) light silty clay loam; weak, medium, subangular blocky structure that breaks to weak to moderate, fine, angular blocky; peds have a few brown to dark-brown (7.5YR 4/4) clay films and common yellowish-brown (10YR 5/4) silt coatings; friable; very strongly acid; clear, smooth boundary.

B21t—12 to 19 inches, yellowish-brown (10YR 5/4 and 5/6) silty clay loam; moderate, medium, subangular blocky structure; a few, dark-brown to brown (7.5YR 4/4), thick, continuous clay films on peds; firm; very strongly acid; abrupt, smooth boundary.

IIB22t—19 to 25 inches, yellowish-brown (10YR 5/4 and 5/6) clay loam; a few, medium, faint, dark yellowish-brown (10YR 4/4) mottles and light brownish-gray (10YR 6/2) streaks; moderate to strong, medium and coarse, angular blocky structure; dark-brown to brown (7.5YR 4/4) discontinuous clay films on peds; a few iron concretions; very hard when dry; very strongly acid; gradual, smooth boundary.

IIB3x—25 to 47 inches, yellowish-brown (10YR 5/6) loam to clay loam; common light brownish-gray (10YR 6/2) streaks and cracks; weak to moderate, coarse, prismatic structure; brown to dark-brown (7.5YR 4/4) patches of clay on surfaces of peds and in root channels; extremely hard when dry; a few iron concretions; very strongly acid; gradual, smooth boundary.

IICx—47 to 60 inches, yellowish-brown (10YR 5/6) loam to clay loam; a few very dark grayish-brown (10YR 3/2) streaks and iron stains; massive; very hard and dense when dry; medium acid.

The texture of the surface layer generally is silt loam, but in severely eroded areas it is silty clay loam. In color the subsoil ranges from dark brown to yellowish brown. The fragipan is yellowish brown, but in less sloping areas a distinct gray layer covers the fragipan. In the more sloping, fairly narrow areas this gray layer is lacking.

The Ava soils are like the Hosmer soils, but they formed partly in loess and partly in glacial till, and the Hosmer

soils formed entirely in loess, which was more than 50 inches thick. They are slightly less well drained than the Hickory soils, which formed in loess less than 18 inches thick over the till, and unlike them, have a fragipan.

Ava silt loam, 2 to 4 percent slopes (14B).—Some areas of this soil are on ridgetops close to strongly sloping Hickory soils on breaks. Other larger areas are narrow, long, and irregular and are on breaks between nearly level, somewhat poorly drained Bluford soils and more sloping Ava soils. The surface layer ranges from 10 to 12 inches in thickness and from dark grayish brown to dark yellowish brown in color.

Included with this soil are small areas of very gently sloping, somewhat poorly drained Bluford soils and more sloping Ava soils. Also included are some Ava soils that have similar slopes but that are moderately eroded and are yellowish brown in color. The surface layer in these moderately eroded soils is very low in organic matter and crusts readily, even after a moderate rain.

The main limitations of this soil are the erosion hazard, slow movement of water in the fragipan, and moderate water-holding capacity. Most areas are fairly small and irregular. It is therefore difficult to construct terraces and diversions, farm on the contour, and use similar practices for conserving soil and water. If losses of soil and water are reduced and if lime and fertilizer are applied, the soil is well suited to the commonly grown grain crops and very well suited to hay and pasture. Growing grasses and legumes in the cropping system, returning all crop residues to the soil, and keeping tillage to a minimum can be used to reduce loss of water and to control erosion. Management group IIe–3; woodland suitability group 4.

Ava silt loam, 4 to 7 percent slopes (14C).—This soil has the profile described for the series. It is on narrow ridges and on breaks that generally are at the upper reaches of draws that extend into very gently sloping, fairly narrow ridges. The areas on the narrow ridges extend into areas of strongly sloping Hickory soils. Other areas are between very gently sloping Ava soils and strongly sloping Hickory soils. Thickness of the surface layer is about 8 to 10 inches.

Included with this soil are small areas of somewhat poorly drained Bluford soils. Also included are some areas of very gently sloping and sloping Ava soils.

The main limitations of this soil are the erosion hazard, slow movement of water in the fragipan, and moderate water-holding capacity. Most areas are fairly small and irregular. It is therefore difficult to install terraces and diversions, farm on the contour, or use similar practices for conserving soil and water. If losses of soil and water are reduced and if lime and fertilizer are applied, this Ava soil is well suited to the grain crops commonly grown in the county and is very well suited to hay and pasture. Growing grasses and legumes in the cropping system, returning all crop residues to the soil, and keeping tillage to a minimum can be used to reduce loss of water and to control erosion. Management group IIIe–5; woodland suitability group 4.

Ava silt loam, 4 to 7 percent slopes, eroded (14C2).—This soil is in waterways and on fairly narrow breaks. The areas in the waterways are between very gently sloping Ava soils and strongly sloping Hickory soils, and those on the breaks are between nearly level Ava soils and Belknap soils.

The surface layer of this soil is yellowish brown and is less than 7 inches thick. Several inches of the original surface layer have been lost through erosion. The present surface layer is erodible. It also crusts readily and thus hinders development of seedlings.

Included with this soil are small areas of somewhat poorly drained Bluford soils and of less sloping and less eroded Ava soils. Also included are some small areas of Ava soils that have similar slopes but are severely eroded. The severely eroded soils have lost most of their original surface layer, and the present surface layer contains more clay than that in the profile described for the series.

The erosion hazard, slow movement of water in the fragipan, and moderate water-holding capacity are the main limitations of this Ava soil. The areas are small and are irregular in shape. It therefore is difficult to install terraces and diversions, to farm on the contour, and to use other similar practices for conserving soil and water. If erosion is controlled, water losses reduced, and tilth improved, this soil is well suited to the common grain crops and is fairly well suited to hay and pasture. Returning all crop residues to the soil, keeping tillage to a minimum, and applying lime and fertilizer can be used to reduce loss of water and to prevent further erosion. Management group IIIe–5; woodland suitability group 4.

Ava soils, 7 to 16 percent slopes, severely eroded (14D3).—Some areas of these soils are in waterways that extend into less sloping areas of Ava soils. Other areas are narrow and are between nearly level Ava soils and somewhat poorly drained, nearly level Belknap soils that are on bottom lands.

These soils have lost most, and in places all, of their original surface layer through erosion. The present surface layer is dark-brown silt loam to silty clay loam and consists mostly of material formerly in the subsoil. Its high content of clay makes preparing a seedbed difficult.

Included with these soils are some small areas of strongly sloping, eroded Hickory soils and of less eroded, gently sloping Ava soils. Also included are small areas that have between 3 and 7 inches of the original surface soil remaining.

Because of severe erosion and strong slopes, these Ava soils are not suited to the grain crops commonly grown in the county. Slow movement of water in the fragipan and moderate water-holding capacity further restrict use. Keeping a cover of hay, pasture, or trees on the areas helps to prevent further erosion and to conserve moisture. If lime and fertilizer are applied, growth of the common grain crops is poor, but that of hay and pasture crops is moderate to good. Management group IVe–4; woodland suitability group 4.

Beaucoup Series

Beaucoup soils are deep, nearly level, dark colored, and poorly drained. These soils are on bottom lands along major rivers and smaller streams. They formed in thick silty clay loam sediment laid down in slack water. The original vegetation was a forest consisting of cottonwood, soft maple, sweetgum, sycamore, elm, ash, and oak.

The surface layer typically is silty clay loam that has blocky structure and is about 14 inches thick. It is very dark gray and has very dark grayish-brown and brown to dark-brown mottles at a depth of 7 inches. The subsoil, also a silty clay loam, has prismatic and coarse blocky structure and is about 39 inches thick. It is dark gray to gray and has mostly brown to dark-brown or olive-brown mottles.

These soils have very high available moisture holding capacity and are moderately permeable. They are slightly acid to mildly alkaline and are medium in available phosphorus and potassium.

Representative profile of Beaucoup silty clay loam, 50 feet west of the road on a slope of less than 1 percent (SW1, NE10, NW40, SE160, sec. 8, T. 9 S., R. 9 E.):

Ap—0 to 7 inches, very dark gray (10YR 3/1) silty clay loam; cloddy; extremely hard; common roots; neutral; abrupt, smooth boundary.

A1—7 to 14 inches, very dark gray (10YR 3/1) silty clay loam; a few, fine, faint, very dark grayish-brown (10YR 3/2) and a few, fine, prominent, brown to dark-brown (7.5YR 4/4) mottles; weak, medium, subangular blocky structure that breaks to weak, fine, angular blocky; firm; iron concretions present; neutral; gradual, smooth boundary.

B1g—14 to 22 inches, dark-gray (10YR to 2.5Y 4/1) silty clay loam; a few, fine, prominent brown to dark-brown (7.5YR 4/4) mottles and many, fine, faint, dark grayish-brown (2.5YR 4/2) mottles; weak, medium, prismatic structure that breaks to weak to moderate, fine and medium, angular blocky; firm; continuous very dark gray (10YR 3/1) coatings; a few small iron concretions; mildly alkaline; gradual, smooth boundary.

B21g—22 to 28 inches, dark-gray (N 4/0) silty clay loam; many, fine, distinct, olive-brown (2.5Y 4/4) mottles and a few, fine, prominent, brown to dark-brown (7.5YR 4/4) to strong-brown (7.5YR 4/6) mottles; weak, coarse, subangular blocky structure that breaks to moderate, medium, angular blocky; firm; continuous dark-gray (10YR 4/1) to very dark gray (10YR 3/1) coatings; common iron concretions that are 1/8 to 3/16 inch in diameter; mildly alkaline; gradual, smooth boundary.

B22g—28 to 40 inches, gray (5Y 5/1) silty clay loam; a few, medium, prominent, dark yellowish-brown (10YR 4/4) mottles; a few, fine, faint, olive-brown (2.5Y 4/4) mottles; and a few, fine, distinct yellowish-brown (10YR 5/6) mottles; weak, coarse, subangular blocky structure; firm; continuous dark-gray (5Y 4/1) coatings; a few, small, black (10YR 2/1) iron concretions; mildly alkaline; gradual, smooth boundary.

B3g—40 to 53 inches, gray (N 5/0) silty clay loam; common, medium, prominent, yellowish-brown (10YR 5/8) mottles; weak, coarse, subangular blocky structure; firm; discontinuous gray (5Y 5/1) coatings; a few black (10YR 2/1) iron concretions one-fourth inch in diameter; mildly alkaline; gradual, smooth boundary.

C—53 to 55 inches +, gray (N 5/0) silty clay loam; common, medium, prominent, strong-brown (7.5YR 5/8) mottles; very weak, coarse, angular blocky structure; firm; mildly alkaline.

The surface layer ranges from black to very dark gray in color and from 10 to 20 inches in thickness. It is slightly acid to neutral. The subsoil is 30 to 40 inches thick and is slightly acid to mildly alkaline.

These soils are similar to Tice soils but unlike them, are mottled just below the plow layer. The Tice soils are free of mottles to a depth of 20 inches. Beaucoup soils have less clay throughout than Darwin soils and have a thicker, darker surface layer than Petrolia soils.

Beaucoup silty clay loam (70).—This is the only Beaucoup soil mapped in the county. It is nearly level and is on broad bottom lands along the Wabash, Ohio, and Saline Rivers and along Cypress Ditch. The areas generally are lower lying than Tice silty clay loam, which is nearby, and are farther from the streams than Sawmill silty clay loam.

Included with this soil are small areas of Tice silty clay loam, which is somewhat poorly drained; of Petrolia silty clay loam, which is light colored; and of sawmill silty clay loam, which is deep and is dark colored. Also included are some small areas of Darwin soils, which are finer textured. Other included small areas are in sloughs that are subject to frequent flooding or consist of areas of this soil that have an overwash of silt.

Beaucoup silty clay loam is suited to intensive farming. It is subject to flooding, however, and the growing of small grain and of hay and pasture crops is risky. Drainage is needed, and tile can be used to provide drainage. When farmed intensively, a dense and compact plowpan is likely to form unless all crop residues are returned to the soil, tillage is kept to a minimum, and other good management is used for improving tilth and permeability. Crops on this soil respond well if nitrogen and other fertilizer are applied. Lime generally is not needed, but lime, phosphorus, and potassium should be applied for good growth of the common grain crops. Johnsongrass and wild cane are a problem in some areas. Management group IIw-6; woodland suitability group 11.

Belknap Series

In the Belknap series are deep, nearly level to very gently sloping, light-colored soils that are somewhat poorly drained. Some areas of these soils are in the southwestern part of the county on bottom lands along the upper reaches of the Saline River, and along Cane Creek, and others are on very gently sloping foot slopes. Still other areas are in the northwestern part of the county on many small bottom lands that extend into the uplands. Belknap soils formed in thick, strongly acid, silty sediment. The original vegetation was a forest of oak, maple, gum, and hickory.

The surface layer generally is brown to dark-brown and dark yellowish-brown silt loam about 9 inches thick. It overlies mottled, grayish-brown silt loam that is about 7 inches thick. Below a depth of 16 inches is silt loam that is mostly mottled gray and grayish brown in color.

These soils have very high available moisture holding capacity. Permeability is moderately slow. They are slightly acid to very strongly acid and are low in available phosphorus and potassium.

Representative profile of Belknap silt loam, 100 feet east of State Route 1 and 300 feet south of State Route 141 (NE10, NW40, NE160, sec. 22, T. 7 S., R. 8 E.):

Ap—0 to 5 inches, brown to dark-brown (10YR 4/3) silt loam; weak, thin, platy structure that breaks to weak, fine and medium, crumb; friable; a few iron concretions; slightly acid; abrupt, smooth boundary.

A1—5 to 9 inches, mixed brown to dark-brown (10YR 4/3), dark yellowish-brown (10YR 4/4), and light brownish-gray (10YR 6/2) silt loam; weak, medium and thick, platy structure that breaks to weak, fine and medium, granular; friable; a few very dark grayish-brown (10YR 3/2) streaks; a few iron concretions; medium acid; clear, smooth boundary.

B1g—9 to 16 inches, grayish-brown (10YR 5/2) silt loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles and a few, fine, faint, brown (10YR 5/3) mottles; a few yellowish-red (5YR 5/6) splotches;

massive; friable; a few iron concretions; strongly acid; abrupt, smooth boundary.

B2g—16 to 23 inches, gray (10YR 5/1) silt loam; many, medium, faint, brown (10YR 5/3) mottles and a few, fine, distinct, yellowish-brown (10YR 5/6 and 5/8) mottles; massive; friable; dark-brown (7.5YR 3/2) streaks; many iron concretions; strongly acid; abrupt, smooth boundary.

C1—23 to 29 inches, brown (10YR 5/3) to dark-brown (10YR 4/3) silt loam; a few, fine, faint, yellowish-brown (10YR 5/6) mottles; massive; friable; many iron concretions; strongly acid; gradual, smooth boundary.

C2—29 to 37 inches, mixed gray (10YR 5/1) and grayish-brown (10YR 5/2) silt loam; a few, fine, faint, dark-brown to brown (10YR 4/3) mottles and a few, medium, prominent, yellowish-red (5YR 3/6) mottles; massive; friable; many black (10YR 2/1) iron concretions and fine streaks; very strongly acid; diffuse, smooth boundary.

C3—37 to 50 inches, mixed gray (10YR 5/1) and grayish-brown (10YR 5/2) silt loam; a few, medium, faint, brown (10YR 5/3) mottles; massive; friable; black (10YR 2/1) streaks that are larger than those in the C4 horizon; medium acid; diffuse, smooth boundary.

C4—50 to 65 inches, mixed gray (10YR 5/1) and grayish-brown (10YR 5/2) silt loam; a few, medium, faint, brown (10YR 5/3) mottles; massive; friable; black (10YR 2/1) streaks; slightly acid.

The surface layer ranges from dark grayish brown to brown in color. Depth to the gray and grayish-brown colors in the underlying layers generally is 29 inches, but it is about 18 inches in some places

Belknap soils are more acid than Wakeland soils. They are not so poorly drained as the Bonnie soils.

Belknap silt loam (382).—This is the only Belknap soil mapped in the county. Some areas are nearly level and are on broad bottom lands along the Saline River and along Cane Creek, and others are very gently sloping and are on the flood plain of Eagle Creek between nearly level Wakeland silt loam and strongly sloping upland soils. Areas of this soil are at a slightly higher elevation than those of the nearby Bonnie silt loam.

Included with this soil are some small areas of the poorly drained Bonnie silt loam.

Belknap silt loam is suited to all crops commonly grown in the county and is being farmed intensively. Moderately slow permeability and occasional flooding are the main limitations. Flooding generally occurs late in winter or early in spring, and the damage to crops is slight.

This soil is somewhat wet. Artificial drainage is needed, and tile drains work well under good management. Applying a complete fertilizer, returning all crop residues to the soil, keeping tillage to a minimum, and providing drainage, where required, are ways of increasing permeability and improving tilth. If lime and fertilizer are added, growth of the common grain crops is moderately good. Management group IIw–4; woodland suitability group 9.

Berks Series

Berks soils are moderately deep to shallow, strongly sloping to steep, light colored, and well drained. These soils occupy rocky areas in the southwestern part of the county. They formed in silty or loamy materials that were less than 20 inches thick over sandstone. The original vegetation was of the oak-hickory forest type.

In most places the surface layer is dark brown to dark yellowish brown silt loam and contains some sandstone fragments. The subsoil is dark yellowish brown to strong brown and loamy and has weak blocky structure. It is about 17 inches thick. The number of rocks increases with increasing depth. The substratum consists of loamy material and of stones; it grades to fractured sandstone with depth.

Berks soils have low available moisture holding capacity and are moderately permeable. They are very strongly acid, are low in available phosphorus, and are high in available potassium.

In this county the Berks soils occur in an intricate pattern with Wellston soils. Therefore they are mapped only in a complex with those soils. The description of this complex follows the description of the Wellston soils in this survey.

Representative profile of a Berks soil loam in the east roadbank, 225 feet north of a culvert (SW10, NW40, NW160, sec. 7, T. 10 S., R. 8 E.):

A1—0 to 2 inches, dark-brown (10YR 3/3 to 4/3) silt loam; weak, fine, granular structure; friable; 5 percent, by volume, is gravel; strongly acid; abrupt, smooth boundary.

A2—2 to 9 inches, dark yellowish-brown (10YR 3/4 to 4/4) silt loam; weak, very thin, platy structure that breaks to weak, fine, granular; friable; 10 percent, by volume, is gravel and cobblestones; very strongly acid; clear, smooth boundary.

B1—9 to 14 inches, dark yellowish-brown (10YR 3/4 to 4/4) silt loam; weak, fine, subangular and angular blocky structure; friable; gravel and cobblestones are larger than in the A2 horizon and make up 30 percent of the volume; very strongly acid; clear, wavy boundary.

B21—14 to 22 inches, strong-brown (7.5YR 5/6) silt loam; weak, fine, subangular blocky structure; friable; a few root channels that have dark-brown (7.5YR 4/4) coatings; 50 to 70 percent, by volume, is rock fragments; very strongly acid; clear, wavy boundary.

B22—22 to 26 inches, strong-brown (7.5YR 5/6) stony silt loam; weak, medium and coarse, subangular blocky structure; friable; pebbles have reddish-brown (5YR 4/4) coatings; a few, medium to coarse, very dark brown (10YR 3/2) iron stains; 50 to 80 percent, by volume, is rocks and rock fragments; very strongly acid; gradual, irregular boundary.

C—26 to 40 inches, mixed reddish-yellow (7.5YR 7/6), strong-brown (7.5YR 5/6), brownish-yellow (10YR 6/6), and very dark grayish-brown (10YR 3/2) stony loam; massive; friable; pebbles have reddish-brown (5YR 4/4) coatings on the under side; a few pockets of reddish-brown (5YR 4/3) silty clay loam; 80 to 90 percent, by volume, is rock fragments that are dominantly the size of gravel; very strongly acid; abrupt, wavy boundary.

R—40 to 70 inches, fractured sandstone bedrock; hard.

In thickness the surface layer ranges from 2 to 9 inches, and the subsoil from 14 to 30 inches. From 5 to 30 percent of the surface layer is fragments of sandstone.

Berks soils have more fragments in and on the surface layer than the Wellston soils, but they have less clay in the subsoil.

Birds Series

In the Birds series are deep, nearly level, light-colored soils that are poorly drained. These soils are mostly in the southwestern part of the county on the flood plain of Eagle Creek. They formed in thick sediment under a forest consisting of cottonwood, ash, oak, and hickory.

The surface layer generally is grayish brown silt loam about 8 inches thick. It overlies gray silt loam that is about 37 inches thick and is somewhat mottled, mostly with brownish gray and dark yellowish brown. This layer is somewhat brittle when dry.

These soils have high available moisture holding capacity and are slowly permeable. They are medium acid to neutral, are low to medium in available phosphorus, and are medium in available potassium.

Representative profile of Birds silt loam on a slope of less than 1 percent (SE1, NE10, NW40, SW160, sec. 7, T. 10 S., R. 8 E.):

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; a few, fine, faint, gray (10YR 6/1) and light brownish-gray (10YR 6/2) mottles; weak, very thin, platy structure that breaks to weak, fine, granular; very friable; a few very dark grayish-brown (10YR 3/2) iron stains; medium acid; abrupt, smooth boundary.

B11g—8 to 12 inches, gray (10YR 6/1) silt loam; a few, fine, distinct, yellowish-brown (10YR 5/8) and dark-brown to brown (7.5YR 4/4) mottles and a few, fine, faint, light brownish-gray (10YR 6/2) mottles; weak to moderate, thin to medium, platy structure that breaks to weak to moderate, fine, granular; friable when moist, but somewhat brittle when dry; vesicular; many, very fine, soft iron concretions; medium acid; gradual, smooth boundary.

B12g—12 to 39 inches, gray (10YR and 2.5Y 6/1) silt loam; a few, fine, faint, light-gray (10YR 7/1) mottles; a few, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; and many, coarse, distinct, very dark grayish-brown (10YR 3/2) mottles; fine root fillings less than one-sixteenth inch in diameter filled with gray (10YR 5/1) material; massive; friable when moist, but somewhat brittle when dry; vesicular; slightly acid; diffuse, smooth boundary.

B13g—39 to 45 inches, gray (10YR and 2.5Y 6/1) silt loam; a few, medium, distinct, yellowish-brown (10YR 5/4) mottles and a few, medium, prominent, dark-brown to brown (7.5YR 4/4) mottles; root channels about one-eighth inch in diameter are filled with gray (10YR 5/1) material; massive; friable when moist, but somewhat brittle when dry; vesicular; common black (10YR 2/1) iron concretions; slightly acid; gradual, smooth boundary.

C—45 to 60 inches, mixed gray (10YR 6/1) and light brownish-gray (10YR 6/2) silt loam; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles and a few, fine, faint, light-gray (10YR 7/1) mottles; massive; friable; common black (10YR 2/1) iron concretions; neutral.

In color the surface layer ranges from dark gray to brown and the subsoil from light gray to gray. Reaction ranges from medium acid to neutral.

Birds soils are not so acid as the Bonnie soils. They have poorer drainage than the somewhat poorly drained Wakeland soils.

Birds silt loam (334).—This is the only Birds soil mapped in the county. It is nearly level and is on broad bottom lands. The areas generally are ponded and are slightly lower than the nearby, somewhat poorly drained Wakeland silt loam, small areas of which are included.

Slow permeability, hazard of flooding, and ponding moderately limit use of this soil. The soil is wet, and flooding makes the growing of small grains risky. It also is silty and crusts readily. Nevertheless, if this soil is drained, it is suited to all crops commonly grown in the county. Surface drains can be used to remove excess surface water, but tile drains are not satisfactory for drainage. Growing green-manure crops, applying a complete fertilizer, keeping tillage to a minimum, and returning all crop residues to the soil increase permeability and improve tilth. Growth of the common grain crops is good if lime and fertilizer are added. Management group IIIw-2; woodland suitability group 10.

Bloomfield Series

Soils of the Bloomfield series are deep, very gently sloping to moderately steep, light colored, and somewhat excessively drained. Some areas of these soils are on knolls in the northeastern part of the county. Other areas are adjacent to the Alford soils and are in the Shawneetown Hills, north of Shawneetown, on slopes that face north and west. These soils formed under oak and hickory trees in deep deposits of sand.

In most places the surface layer is about 20 inches thick. The upper 8 inches is brown to dark-brown fine sand. It overlies yellowish-brown loamy sand that is about 12 inches thick. Below are thin alternating layers of dark-brown, loamy material and yellowish-brown, sandy material.

Bloomfield soils have low to very low available moisture holding capacity and are rapidly permeable. Because they are sandy, they hold little water available for crop growth and are very droughty. These soils generally are medium acid and are low in available phosphorus, potassium, and nitrogen.

Representative profile of a Bloomfield fine sand, 90 feet northwest of the culvert at the first entrance to the field, on about a 10 percent slope (SE10, NW40, NW160, sec. 2, T. 9 S., R. 9 E.):

Ap—0 to 8 inches, brown to dark-brown (10YR 4/3) fine sand; weak, very fine, granular structure; very friable; many roots; mildly alkaline; abrupt, smooth boundary.

A2—8 to 20 inches, yellowish-brown (10YR 5/4) loamy sand; single grain; loose; roots common; slightly acid; abrupt, wavy boundary.

A2&B2—20 to 42 inches, alternating layers of brown to dark-brown (7.5YR 4/4) sandy loam 1/8 to 1/2 inch thick and yellowish-brown (10YR 5/4) loamy sand 2 to 6 inches thick; the sandy loam has weak, fine and very fine, subangular blocky structure, is friable, and is slightly acid; the loamy sand is single grain, is loose, and is medium acid; a few roots; abrupt, wavy boundary.

B2&A2—42 to 80 inches +, alternating layers of brown to dark-brown (7.5YR 4/4) sandy loam to sandy clay loam 6 to 10 inches thick and yellowish-brown (10YR 5/4) loamy sand 1 to 2 inches thick; the sandy loam has weak, medium and coarse, subangular blocky structure, is friable to firm, and is medium acid; the loamy sand is single grain, loose, and medium acid; a few roots.

The surface layer ranges from loamy fine sand to fine sand in texture and from reddish brown to dark brown in color. At a depth between 20 and 60 inches are thin layers that range from 1/8 to 10 inches in thickness. These layers are fairly horizontal and are redder than the other layers in the profile. They also are higher in iron and clay and are clearly apparent when the face of the soil is exposed.

Bloomfield soils are similar to Lamont soils but have a thinner, coarser textured subsoil.

Bloomfield fine sand, 1 to 12 percent slopes (53C).—This soil has the profile described for the series. Some areas are gently sloping and are on knolls above areas of light-colored Lamont soils. Other areas are surrounded by darker colored, medium-textured Harco and Plano soils. Still other areas are sloping and occupy areas below Lamont and Alvin soils and above darker colored, fine-textured Karnak and Sawmill soils.

Included with this soil are some small areas of the less droughty Lamont soils. Also included are a few small areas in which the stratified layers are thinner than in the profile described and are at a greater depth.

Many areas of this Bloomfield soil have been cleared and planted to the crops commonly grown in the county. The very low water-holding capacity and droughtiness are serious limitations. Wind erosion also is a serious hazard.

This soil is better suited to watermelons, grasses, deep-rooted legumes, and trees than to other uses. Lime, phosphorus, potassium, and nitrogen are needed for good growth of watermelons, pasture, or hay. The soil is sandy, however, and fertilizer leaches away readily. Fertilizer therefore needs to be applied annually. Growing grasses and legumes in the cropping system for a long time is a way to control wind erosion. Management group IVs–1; woodland suitability group 8.

Bloomfield fine sand, 12 to 30 percent slopes (53E).—Some areas of this soil are on side slopes of knolls above areas of light-colored Lamont soils. In some places the knolls are surrounded by darker colored, medium-textured Harco and Plano soils. Other areas occupy long, narrow slopes below less droughty Alvin and Lamont soils and above darker colored, fine-textured Karnak and Sawmill soils. The surface layer is loamy fine sand to fine sand that is 30 to 40 inches thick.

Included with this soil are small areas of Lamont soils. Also included are a few small areas in which the stratified layers are thinner than in the profile described and also are at greater depths.

This Bloomfield soil is better suited to trees than to other uses. Some areas have been cleared and farmed in the past, but they now are either idle or are seeded to pasture. Other areas remain in woods. Very low water-holding capacity, droughtiness, and slopes are serious limitations. Also, wind and water erosion are serious hazards. If this soil is used for pasture, lime, phosphorus, potassium, and nitrogen are needed. The soil is sandy, however, and fertilizer leaches away readily. Fertilizer therefore needs to be applied annually. Management group VIIs–1; woodland suitability group 8.

Bluford Series

The Bluford soils are deep, nearly level to gently sloping, light colored, and somewhat poorly drained. These soils are in the uplands in the northwestern corner of the county. They formed in silty windblown material, or loess, that was 20 to 50 inches thick over leached glacial till of Illinoian age. The original vegetation was a forest of the oak-hickory type.

The surface layer typically is silty and generally is about 12 inches thick. It is dark brown in the upper part and light brownish gray and grayish brown in the lower part. The upper part of the subsoil formed in silty material, and the lower part, in glacial material.

Bluford soils have moderate to high available moisture holding capacity and are slowly permeable. They are strongly acid to extremely acid, are very low in available phosphorus, and are low in available potassium.

Representative profile of a Bluford silt loam on a slope of about 2 percent, 640 feet west of a gravel road (NW10, NE40, NE160, sec. 21, T. 7 S., R. 8 E.):

Ap—0 to 8 inches, dark-brown (10YR 3/3 to 4/3) silt loam; brown (10YR 5/3) when dry; weak, fine, granular structure; friable, but slightly hard when dry; common roots; mildly alkaline; abrupt, smooth boundary.

A21—8 to 11 inches, light brownish-gray (10YR 6/2) silt loam; a few, medium, distinct, pale-brown (10YR 6/3) and yellowish-brown (10YR 5/4 and 5/6) mottles; weak, thin, platy structure; friable, but slightly hard when dry; a few roots and iron concretions; strongly acid; clear, smooth boundary.

A22—11 to 17 inches, mixed light brownish-gray (10YR 6/2) and grayish-brown (10YR 5/2) silt loam; weak, fine and medium, granular structure; friable when moist, but slightly hard when dry; a few roots and iron concretions; very strongly acid; abrupt, irregular boundary.

A&B—17 to 20 inches, light brownish-gray (10YR 6/2) silt loam to silty clay loam; mixed grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6 and 5/8) mottles; weak to moderate, fine and medium, subangular blocky structure; firm when moist, but hard when dry; common roots and iron concretions; extremely acid; gradual, smooth boundary.

B21t—20 to 24 inches, pale-brown (10YR 6/3) to brown (10YR 5/3) heavy silty clay loam; many, medium, faint, dark brownish-yellow (10YR 6/6) mottles and a few, medium, faint, dark-brown (10YR 4/3) mottles; weak, fine, prismatic structure that breaks to moderate, fine and medium, subangular blocky; peds have light brownish-gray (10YR 6/2) silt coatings that appear light gray (10YR 5/6, 5/8, and 5/4) when moist, but hard when dry; common roots and iron concretions; extremely acid; gradual, smooth boundary.

IIB22t—24 to 30 inches, mixed light brownish-gray (10YR 6/2), yellowish-brown (10YR 5/6, 5/8, and 5/4) heavy silty clay loam; moderate, medium and coarse, subangular blocky structure; firm; grayish-brown (10YR 5/2), dark grayish-brown (10YR 4/2), and brown (10YR 5/3) clay films on peds; a few black (10YR 2/1) root channels; a few small iron concretions; common small pebbles; a few roots; extremely acid; gradual, smooth boundary.

IIB3—30 to 36 inches, mixed light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/6, 5/8, and 5/4) silty clay loam; a few, medium, prominent, dark reddish-brown splotches; weak, coarse, subangular blocky structure; firm when moist, but somewhat brittle when dry; a few dark-brown (10YR 4/3) patchy coats; a few roots and iron concretions; common small pebbles; extremely acid; clear, smooth boundary.

IIC—36 to 46 inches +, mixed light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/6, 5/8, and 5/4) silt loam; common small pebbles; massive; firm; extremely acid.

The thickness of the surface layer ranges from 17 inches in uneroded areas to 4 inches in moderately eroded areas. In color the surface layer ranges from light brownish gray to yellowish brown. Gray silt coatings in the profile are more intense on slopes of less than 1 percent and less intense in areas where slopes exceed 5 percent. Iron concretions are common on the surface of nearly level areas, but they are either less numerous or are lacking in gently sloping areas.

The Bluford soils are similar to the Stoy soils, but they formed in loess less than 50 inches thick and the Stoy soils formed in loess more than 50 inches thick. They also are similar to the Ava soils, but unlike them, are mottled in the subsoil. Ava soils are free of mottling in the upper part of the subsoil. Unlike the Wynoose and Weir soils, Bluford soils are free of gray and light-gray mottles in the surface layer and generally are pale brown or grayish brown just below.

Bluford silt loam, 1 to 4 percent slopes (13B).—This soil has the profile described for the series. Some areas are on broad ridgetops. Other areas occupy broad, irregular strips at the edge of breaks. On the ridgetops this soil lies above gently sloping Bluford soils and sloping Hickory soils. On the edge of slope breaks, the areas are between sloping Hickory soils and Wynoose and Weir soils. The nearly level areas are at a slightly higher elevation than the Wynoose and Weir soils, which occupy shallow depressions within large areas of this soil. In color the surface layer ranges from dark brown to grayish brown.

Included with this soil are small areas of nearly level, poorly drained Wynoose and Weir soils. Also included are some small areas of very gently sloping, moderately well drained to well drained Ava soils.

Slow permeability and slight hazard of erosion are the main limitations of this Bluford soil. In the nearly level areas, wetness also is likely to be a problem. If erosion is controlled, wetness is reduced, and lime and fertilizer are applied, this soil is suited to all crops commonly grown in the county. Surface drains can be used to provide drainage, but tile drains do not work well. Including grasses and legumes in the cropping system, keeping tillage to a minimum, and returning all crop residues to the soil are ways of controlling erosion. Farming on the contour and terracing also help in the control of erosion, but these practices can be used only if ways are provided for safely removing excess runoff. Management group IIw–3; woodland suitability group 1.

Bluford silt loam, 4 to 7 percent sopes, eroded (13C2).—Some areas of this soil are on slope breaks just below very gently sloping Bluford soils and above somewhat poorly drained Wakeland soils. Other areas are in draws that extend into nearly level Bluford soils. The areas are fairly narrow and the slopes are irregular.

The surface layer of this soil ranges from light brownish gray to yellowish brown. All but 3 to 7 inches of the original surface layer has been removed through erosion. Plowing has mixed silty clay loam formerly in the subsoil with the remaining surface layer. The present surface layer consequently is low in organic matter and crusts readily. It is more clayey than that in the profile described for the series. Gray silt coatings and mottles in the subsoil are also less abundant and less intense.

Included with this soil are some small areas of very gently sloping Bluford soils. Also included are small areas of gently sloping Hickory soils and small areas of severely eroded soils.

Slow permeability and severe hazard of further erosion are the main limitations of this Bluford soil. Under good management this soil is moderately well suited to the common grain crops and is well suited to hay and pasture. Good management consists of applying lime and fertilizer. It also consists of growing cover crops, keeping tillage to a minimum, and returning all crop residues to the soil for control of erosion. Irregular slopes make use of contour farming and terracing for control of erosion difficult. Management group IIIe–6; woodland suitability group 1.

Bold Series

In the Bold series are deep, moderately sloping, light-colored soils that are well drained. These soils are in the uplands north of Shawneetown. They formed in calcareous, silty windblown material, or loess, more than 7 feet thick. The loess was laid down in places once occupied by Alford soils after most of the material making up the Alford soils was removed by erosion.

The surface layer typically is brown to dark-brown, calcareous silt loam that is 6 to 8 inches thick. It overlies brown to grayish-brown and yellowish-brown silt loam to silt. All layers are massive and friable.

These soils have high available moisture holding capacity and are moderately permeable. They are calcareous, are low in available phosphorus, and are medium to high in available potassium.

In this county Bold soils occur in an intricate pattern with Alford soils. They are therefore mapped only in a complex with those soils. The description of this complex follows the description of the Alford soils in this survey.

Representative profile of a Bold silt loam, 250 feet north of road running east to west and 780 feet east of road running north to south (SE10, NW40, SW160, sec. 24, T. 9 S., R. 9 E.):

Ap—0 to 6 inches, brown to dark-brown (10YR 4/3) silt loam; massive; friable; a few calcium concretions; calcareous; abrupt, smooth boundary.

C1—6 to 21 inches, brown (10YR 5/3) silt to silt loam; massive; friable; calcareous; gradual, smooth boundary.

C2—21 to 30 inches, mixed grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/4 and 5/6) silt to silt loam; specks of very dark grayish brown (10YR 3/2); massive; friable; calcareous; clear, smooth boundary.

C3—30 to 50 inches, yellowish-brown (10YR 5/6) silt to silt loam; common, medium, faint mottles of grayish brown (10YR 5/2); massive; friable; calcareous.

The surface layer ranges from brown to yellowish brown in color. It ranges from silt loam to coarse silt in texture.

Bold soils are associated with Alford soils, but unlike them, lack a B horizon and are calcareous in all layers.

Bonnie Series

The Bonnie soils are deep, nearly level, light colored, and poorly drained. These soils are mostly on bottom lands along the upper reaches of the Saline River in the northwestern part of the county. A few small areas are in the southern part of the county along the Saline River. Bonnie soils formed in thick, acid, silty sediment. The original vegetation was a forest consisting chiefly of black oak, pin oak, and hickory.

The surface layer generally is brown silt loam about 8 inches thick. It overlies light gray to gray silt loam that is somewhat brittle and dense, is about 32 inches thick, and has some faint mottles that are mostly grayish brown and brownish yellow.

These soils have high available moisture capacity and are slowly permeable. They are strongly acid to very strongly acid, are low in available phosphorus, and are low to medium in available potassium.

Representative profile of Bonnie silt loam on a slope of less than 1 percent, 330 feet west of the section line (SE10, NE40, SE160, sec. 20, T. 7 S., R. 8 E.):

Ap—0 to 8 inches, brown (10YR 4/3) silt loam; weak, thin, platy structure; friable; medium acid; abrupt, smooth boundary.

B11g—8 to 10 inches, light-gray (10YR 7/1) silt loam; many, medium, distinct, brown (10YR 5/3) mottles and a few, fine, distinct, very dark grayish-brown (10YR 3/2) mottles; weak, medium, platy structure; friable; common iron concretions; vesicular; very strongly acid; gradual, smooth boundary.

B12g—10 to 30 inches, gray (10YR 6/1) silt loam; many, medium, faint grayish-brown (10YR 5/2) mottles; a few, medium, distinct, brownish-yellow (10YR 6/6) mottles; and a few, fine, faint, light-gray (10YR 7/1) mottles; massive; somewhat brittle; vesicular; common iron concretions; very strongly acid; gradual, smooth boundary.

B13g—30 to 40 inches, gray (10YR 6/1) silt loam; many, medium, distinct, brown (10YR 4/3) and grayish-brown (10YR 5/2) mottles; massive; somewhat brittle; a few layers of light-gray (10YR 7/1) silt and of brown (10YR 4/3) silty clay loam 1/8 to 1/4 inch thick; common iron concretions; strongly acid; gradual, smooth boundary.

C—40 to 60 inches +, gray (10YR 6/1) silt loam; massive; friable; many, large, very dark grayish-brown (10YR 3/2) iron concretions and stains; vesicular; strongly acid.

In color the surface layer ranges from dark gray to brown, and the subsoil, from light gray to gray. Reaction ranges from strongly acid to very strongly acid.

Bonnie soils are more acid than the Birds soils and have poorer drainage than the Belknap soils. They have a subsoil of silt loam, unlike the Racoon soils that have a subsoil of silty clay loam.

Bonnie silt loam (108).—This is the only Bonnie soil mapped in the county. It is nearly level and is on broad bottom lands along the Saline River. The areas generally are ponded and are slightly lower than areas of nearby Belknap silt loam. They range from 40 to 100 or more acres in size.

Included with this soil are small areas of somewhat poorly drained Belknap silt loam. Also included are small areas of poorly drained Racoon silt loam, which has a subsoil of silty clay loam at a depth below 28 inches.

Bonnie silt loam is subject to flooding. Slow permeability and low fertility are other limitations. In addition the soil is silty and crusts readily. This soil also is wet, and drainage is needed (fig. 10). Surface drains can be used to remove excess water, but tile drains are not satisfactory.

Because this soil is subject to flooding, the growing of small grains is risky. If flooding is controlled and if lime and fertilizer are applied, the common grain crops grow well. Growing green-manure crops, applying a complete fertilizer, keeping tillage to a minimum, and providing drainage are ways of increasing permeability and improving tilth and fertility. Management group IIIw-2; woodland suitability group 10.

Figure 10.—**Typical area of Bonnie silt loam, needing drainage; note the crayfish chimneys.**

Burnside Series

In the Burnside series are moderately deep, nearly level to very gently sloping soils. These soils are light colored and are moderately well drained. They are in the southern part of the county on narrow bottom lands that extend into moderately sloping to steep uplands. These soils formed in silty sediment 12 to 30 inches thick over cobbly and channery sandstone. The original vegetation consisted of mixed stands of oak and hickory trees.

In most places the surface layer is dark grayish-brown silt loam about 8 inches thick. Just below is about 16 inches of mixed brown and dark-brown silt loam and some stratified sand. Depth to cobbly or channery rock generally is 24 inches. Some silty material is between the rocks.

These soils have moderate available moisture holding capacity and are moderately permeable. They are medium acid to strongly acid and are low in available phosphorus and potassium.

Representative profile of Burnside silt loam on a slope of less than 2 percent (NW10, NW40, SE160, sec. 34, T. 9 S., R. 8 E.):

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

C1—8 to 24 inches, mixed brown (10YR 4/3) and dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; friable; common iron concretions; some thin strata of very dark grayish-brown (10YR 3/2) to black (10YR 2/1) iron concretions and some thin strata of dark-brown (7.5YR 3/4) sand; medium acid; abrupt, smooth boundary.

IIC2—24 to 48 inches +, very cobbly and channery material that has some dark grayish-brown (10YR 4/2) silt loam between the rocks; rocks make up more than 90 percent of the volume; strongly acid.

The surface layer ranges from dark grayish brown to yellowish brown. Depth to cobbly or channery rock ranges between 12 and 30 inches. In some places the rock is weakly cemented.

Burnside soils are similar to Haymond soils, but unlike them, have cobbly or channery rock at a depth of less than 30 inches. They also are more acid than Haymond soils.

Burnside silt loam (427).—This is the only Burnside soil mapped in the county. It is nearly level to gently sloping and occupies the upper reaches of very narrow bottom lands. The areas extend into moderately sloping to steep nearby uplands, which generally consist of Wellston-Berks complex, 12 to 60 percent slopes, eroded. They are slightly higher than areas of Wakeland silt loam, which also is on bottom lands.

Included with this soil are some small areas of Wakeland silt loam, which is deeper than this soil. Also included are small areas that have a cover of sandstone rubble.

Most areas of Burnside silt loam have a cover of trees. Moderate water-holding capacity and occasional flooding by headwaters are the main limitations. The floodwater leaves a deposit of silt on plants but causes little damage otherwise. Under good management, which includes adding lime and fertilizer, this soil is moderately well suited to well suited to all crops commonly grown in the county. Returning all crop residues to the soil, keeping tillage to a minimum, and similar management practices are needed for improving tilth and water-holding capacity. Management group IIs-2; woodland suitability group 9.

Camden Series

The Camden soils are deep, nearly level to sloping, light colored, and well drained. These soils are on ridges and knolls on broad terraces, chiefly in the central part of the county. They formed under a hardwood forest in silty material about 30 inches thick over sandy loam to fine sandy loam. In places stratified sand, silt, and clay are in the substratum.

The surface layer typically is very friable, brown to dark-brown silt loam that is about 8 inches thick. It overlies subsoil consisting of brown to strong-brown silty clay loam. The upper part of the subsoil formed in silty material, and the lower part formed in sandy material. Below a depth of about 32 inches is strong-brown sandy loam.

These soils have high available moisture capacity and are moderately permeable. They generally are medium acid, are low in available phosphorus, and are medium in available potassium.

Representative profile of a Camden silt loam on a slope of 3 percent (NW10, NE40, NW160, sec. 15, T. 9 S., R. 8 E.):

Ap—0 to 8 inches, brown to dark-brown (10YR 4/3) silt loam; moderate, fine, granular structure; very friable; a few iron concretions; slightly acid; clear, smooth boundary.

B1—8 to 12 inches, brown to dark-brown (7.5YR 4/4) light silty clay loam; moderate, fine, subangular blocky structure that breaks to moderate, fine, granular; friable; a few iron concretions; medium acid; clear, wavy boundary.

B21t—12 to 17 inches, brown to dark-brown (7.5YR 4/4) silty clay loam; moderate to strong, fine to medium, subangular blocky structure; friable to firm; a few brown to dark-brown (7.5YR 4/4) worm casts and roots; medium acid; abrupt, smooth boundary.

IIB22t—17 to 24 inches, strong-brown (7.5YR 5/6) light silty clay loam; moderate, medium, angular blocky structure; friable to firm; dark-brown (7.5YR 3/4) discontinuous clay coatings; a few iron concretions and roots; medium acid; clear, smooth boundary.

IIB3—24 to 32 inches, strong-brown (7.5YR 5/8) heavy silt loam to loam; very weak to weak, coarse, angular blocky structure; friable; pressure faces that are a little darker than the ped interiors; a few iron concretions and roots; medium acid; clear, smooth boundary.

IIC—32 to 50 inches, strong-brown (7.5YR 5/6) sandy loam; single grain; friable; a few iron concretions and roots; mildly alkaline.

The surface layer ranges from dark grayish-brown to brown in color. Depth to sandy loam material generally ranges from 24 to 36 inches, but in places it is as much as 40 inches. Reaction ranges from medium acid to strongly acid.

Camden soils are similar to Uniontown soils, but unlike them, have sand in the lower part of the subsoil. Uniontown soils have a subsoil formed entirely in silty material. Camden soils also are similar to Starks soils but are free of mottles.

Camden silt loam, 0 to 2 percent slopes (134A).—This soil occupies fairly broad, long areas on terraces in the central part of the county. It generally is surrounded, or partly surrounded, by dark-colored Patton silty clay loam or by moderately dark colored Marissa silt loam, which occupy lower areas.

The surface layer is dark grayish-brown and is about 12 inches thick. Depth to sandy material is about 32 inches.

Included with this soil are small areas of gently sloping Camden soils, of somewhat poorly drained Starks soils, and of well-drained Uniontown soils, which are more silty in the lower part of the profile. Also included are small areas that have less than 4 inches of their original surface soil remaining, probably because of land leveling.

This Camden soil is well suited to all of the crops commonly grown in the county and can be cultivated intensively. Adding lime and fertilizer, returning all crop residues to the soil, and other simple management practices are needed. Management group I–2, woodland suitability group 2.

Camden silt loam, 2 to 4 percent slopes (134B).—This soil has the profile described for the series. It is on long, slightly convex areas on ridges or is on long, simple slopes. The areas are somewhat higher than those occupied by the nearly level, somewhat poorly drained, silty Reesville soils. They also are higher than those areas occupied by the nearby nearly level, poorly drained, fine-textured Patton silty clay loam. They are between other Camden soils and higher lying, nearly level Reesville and Starks soils, which are somewhat poorly drained. Erosion is a hazard.

Included with this soil are some areas of well-drained, silty Uniontown soils and of Reesville soils, which have a subsoil that formed entirely in silty material. Also included are small areas of Starks soils, which have a subsoil that formed partly in silty material and partly in sandy material. Other included areas are made up of small moderately eroded areas that have less than 7 inches of their original surface soil remaining. In these moderately eroded areas, silty clay loam material formerly in the subsoil has been mixed with the remaining surface soil by plowing. Here the present surface layer is brown and somewhat finer textured than the original one. It also is low in organic matter and crusts readily.

Under good management, which includes adding lime and fertilizer, this Camden soil is suited to all crops commonly grown in the county. Growing grasses and legumes in the cropping system and returning all crop residues to the soil are ways of controlling erosion. Management group IIe–2; woodland suitability group 2.

Camden silt loam, 4 to 10 percent slopes, eroded (134C2).—Some areas of this soil are in waterways that extend into nearly level areas of Camden soils or of deep, silty Uniontown soils. Other areas occupy narrow, irregular slopes below nearly level Camden or Uniontown soils and above dark-colored Patton silty clay loam or nearly level, somewhat poorly drained Wakeland silt loam, on bottom lands.

This soil has lost much of its original surface layer through erosion, and material formerly in the subsoil has been mixed with the remaining surface soil by plowing. The present surface soil is brown and is somewhat finer textured than that in the profile described for the series. It also is lower in organic matter and crusts more readily. In addition, the subsoil is thinner. It is about 15 inches thick. Because of erosion, runoff is greater and less water moves into the soil and is held available for plants.

Included with this soil are small areas of coarser textured Alvin soils and of deep, silty Uniontown soils. Also included are some small areas of less sloping Camden soils.

Under good management, which includes adding lime and fertilizer, this Camden soil is suited to all crops commonly grown in the county. This soil erodes readily if farmed intensively. The irregular slopes make constructing terraces and diversions, farming on the contour, and applying similar practices for the control of erosion difficult. Practices needed are including grasses and legumes in the cropping system and returning all crop residues to soil, and keeping tillage to a minimum. Management group IIe–2, woodland suitability group 2.

Camden soils, 4 to 7 percent slopes, severely eroded (134C3).—Some areas of these soils are in waterways that extend into areas of nearly level to very gently sloping Camden soils or of deep, silty Uniontown soils. Other areas are on narrow, irregular slopes below very gently sloping Camden soils or Uniontown soils. These areas also are above dark-colored Patton silty clay loam, on terraces, or nearly level, somewhat poorly drained Wakeland silt loam, on bottom lands.

These soils have lost most of their original surface layer through erosion. The present surface layer consists mainly of material formerly in the subsoil and ranges from fine sandy loam to silty clay loam in texture. It is lighter colored and finer textured than the surface layer in the profile described for the series. Also, the subsoil is thinner. It is about 12 inches thick. Because of erosion, runoff is greater and less water moves into the soils and is held available for crops. The hazard of further erosion is severe.

Included with these soils are small areas of coarser textured Alvin soils and of silty Uniontown soils. Also included are some small areas of less sloping, less eroded Camden soils.

Under good management, which includes adding lime and fertilizer, these Camden soils are well suited to all crops commonly grown in the county. The irregular slopes make constructing terraces and diversions, farming on the contour, and applying similar practices for the control of erosion difficult. Practices needed are growing grasses and legumes in the cropping system, applying a complete fertilizer, keeping tillage to a minimum, and returning all crop residues to the soils. These practices increase permeability, reduce erosion, improve tilth, and increase the water-holding capacity of the soils. Management group IIIe–3; woodland suitability group 2.

Camden soils, 7 to 20 percent slopes, severely eroded (134D3).—These soils are on narrow, irregular slopes below gently sloping Camden soils and above nearly level, somewhat poorly drained Wakeland silt loam or dark-colored Patton silty clay loam. The Wakeland soil is on bottom lands, and the Patton soil is on terraces.

Most of the original surface layer of these soils has been lost through erosion. The present surface layer consists mostly of material formerly in the subsoil and ranges from fine sandy loam to silty clay loam in texture. It is lighter colored and finer textured than that in the profile described for the series. In addition the subsoil is thinner. It generally is about 12 inches thick but in some places it all has been eroded away and the sandy substratum exposed. Because of erosion, runoff is greater and less water moves into the soil and is held available for plants. The hazard of further erosion is severe.

Included with these soils are small areas of coarser textured Alvin soils. Also included are some areas of less eroded Camden soils.

These Camden soils are better suited to hay and pasture than to cultivated crops. The irregular, strong slopes make constructing terraces and diversions, farming on the contour, and using similar practices for control of erosion difficult. Growing grasses and legumes in the cropping system for much of the time is a way of reducing runoff and thus preventing further erosion. Other practices needed are returning all crop residues to the soil, keeping tillage to a minimum, and adding lime and fertilizer. Management group IVe–2; woodland suitability group 2.

Creal Series

In the Creal series are deep, nearly level to very gently sloping, light-colored soils that are somewhat poorly drained. These soils are in the northwestern part of the county on foot slopes adjacent to the uplands. They formed under oak and hickory trees in silty material washed from the uplands.

The surface layer generally is dark grayish-brown to yellowish-brown silt loam about 28 inches thick. It overlies mottled, yellowish-brown and grayish-brown silty clay loam.

These soils have high available moisture holding capacity and are slowly permeable. They are very strongly acid, are low in available phosphorus, and medium in available potassium.

Representative profile of Creal silt loam on a slope of about 3 percent, 50 feet east of a road running from the north to the south and 380 feet south of the center of the road going to the entrance of a cemetery (NW40, SW160, sec. 31, T. 7 S., R. 8 E.):

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

A21—8 to 15 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure; friable; strongly acid; gradual, smooth boundary.

A22—15 to 28 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, subangular blocky structure that breaks to weak, fine and medium, granular; friable; very strongly acid; clear, smooth boundary.

A23&B1—28 to 31 inches, mottled grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/8) light silty clay loam; weak, fine and coarse, subangular blocky structure; friable to firm; thick light-gray (10YR 7/2) silt coatings on ped faces in the upper part of this horizon and discontinuous brown (10YR 4/3) clay coatings on ped faces in the lower part of this horizon; very strongly acid; clear, smooth boundary.

B21t—31 to 35 inches, yellowish-brown (10YR 5/4) silty clay loam; common, fine, distinct, light brownish-gray (10YR 6/2) mottles and common, fine, faint, yellowish-brown (10YR 5/8) mottles; weak to moderate, medium, subangular blocky structure that breaks to moderate, fine angular blocky; firm; continuous, thick, brown (10YR 4/3) clay coatings; common iron concretions and roots; very strongly acid; clear, smooth boundary.

B22t—35 to 43 inches, mottled grayish-brown (10YR 5/2), brown (10YR 5/3), yellowish-brown (10YR 5/4, 5/6, and 5/8), and light-gray (10YR 7/2) silty clay loam; weak, medium and coarse, subangular blocky structure; firm; patchy brown (10YR 4/3) to dark yellowish-brown (10YR 4/4) clay coatings; many, medium, prominent, very dark brown (10YR 2/2) iron streaks; dark yellowish-brown (10YR 4/4) clay fillings; a few small iron concretions and roots; very strongly acid; clear, smooth boundary.

B3—43 to 50 inches, mottled grayish-brown (10YR 5/2), brown (10YR 5/3), yellowish-brown (10YR 5/6), and light brownish-gray (10YR 6/2) light silty clay loam or heavy silt loam; weak, coarse, blocky structure; firm; very strongly acid; clear, wavy boundary.

C—50 to 60 inches, mottled grayish-brown (10YR 5/2), brown (10YR 5/3), yellowish-brown (10YR 5/6 and 5/8), light brownish-gray (10YR 6/2), and pale-brown (10YR 6/3) silt loam; a few, fine, distinct, white (10YR 8/1) mottles; massive; firm to friable; common, fine, prominent, very dark brown (10YR 2/2) iron specks and streaks; brown (10YR 4/3) root fillings; very strongly acid.

In thickness the surface layer ranges from 26 to 36 inches, and the subsoil, from 8 to 20 inches. The texture of the subsoil ranges from light silty clay loam to fine silty clay loam.

Creal soils are similar to Bluford soils, but their surface layer and subsurface layer combined are more than 24 inches thick and these layers in Bluford soils are less than 24 inches thick.

Creal silt loam, 1 to 5 percent slopes (337B).—This is the only Creal soil mapped in the county. It occupies fairly narrow, long areas adjacent to irregular slopes in the uplands. It generally is on foot slopes below sloping, light-colored Bluford and Ava soils, which are in the uplands, and above silty, light-colored Belknap and Bonnie soils, which are on bottom lands. In places the areas are above Racoon soils, which also are on foot slopes.

Included with this soil are small areas of nearly level Bluford soils and of gently sloping Bluford soils. Also included are some small areas of the nearly level, poorly drained Racoon silt loam.

Slow permeability and slight hazard of erosion are the chief limitations of Creal silt loam, 1 to 5 percent slopes. In nearly level areas excess water is also likely to be a problem. Here drainage can be provided by use of surface ditches. Tile drains are not satisfactory. Under good management, which includes adding lime and fertilizer, this soil is well suited to all crops commonly grown in the county. Growing grasses and legumes in the cropping system, returning all crop residues to the soil, and keeping tillage to a minimum can be used for control of erosion. Terracing, farming on the contour, and use of other similar practices also help in the control of erosion. These practices can be used, however, only if ways are provided for safely removing excess water that accumulates on the surface. Management group IIw-3; woodland suitability group 1.

Darwin Series

Darwin soils are deep, nearly level, dark colored, and poorly drained. These soils are on bottom lands along the Ohio and Saline Rivers and along Cypress Ditch. They formed in thick sediment, consisting of silty clay to clay, laid down in slack water. The original vegetation was a mixture of hardwood trees and grasses.

The surface layer typically is very dark gray silty clay. It is underlain by mottled dark-gray silty clay to clay.

These soils have moderate to high available moisture holding capacity and are very slowly permeable. They generally are slightly acid to neutral and are medium in available phosphorus and potassium.

Representative profile of Darwin silty clay on a slope of less than 1 percent (SW. corner, NE10, NE40, NW160, sec. 30, T. 9 S., R. 9 E.):

Ap—0 to 8 inches, very dark gray (10YR 3/1) silty clay that is dark gray (10YR 4/1) when dry; weak, fine and medium, granular structure; firm; many roots; slightly acid; abrupt, smooth boundary.

A1—8 to 16 inches, very dark gray (10YR 3/1) silty clay that contains some grit; weak, medium, angular blocky structure that breaks to moderate, fine, subangular blocky; firm; common roots; slightly acid; gradual, smooth boundary.

B11g—16 to 24 inches, dark-gray (N 4/0) silty clay to clay that contains much grit; a few, fine, faint, dark grayish-brown (10YR 4/2) and brown (10YR 4/3) mottles; weak, medium, subangular blocky structure that breaks to moderate, fine and medium, angular blocky; firm; thin, discontinuous, very dark gray (10YR 3/1) clay coatings; common roots; slightly acid; gradual, smooth boundary.

B12g—24 to 40 inches, dark-gray (5Y 4/1) clay that contains much grit; many, fine, distinct, olive (5Y 4/3) mottles; a few, fine, prominent, strong-brown (7.5YR 5/8) mottles; and a few, fine, faint, dark grayish-brown (2.5Y 4/2) mottles; weak, medium, subangular blocky structure that breaks to moderate, medium, prismatic; continuous gray (N 5/0) to dark-gray (N 4/0) clay coatings; common roots; neutral; gradual, smooth boundary.

B3g—40 to 43 inches, dark-gray (5Y 4/1) clay that is somewhat gritty; many, fine, distinct, olive (5Y 4/3) mottles; a few, fine, prominent, strong-brown (7.5YR 5/8) mottles; and a few, fine, faint, dark grayish-brown (2.5Y 4/2) mottles; weak to moderate, coarse, prismatic structure; firm; moderate and thin, discontinuous, gray (5Y 5/1) to dark-gray (5Y 4/1) clay coatings; a few roots; calcareous; gradual, smooth boundary.

Cg—43 to 50 inches, dark-gray (5Y 4/1) silty clay to clay that is somewhat gritty; a few, medium, distinct, brown (10YR 4/3 and 5/3) and olive-brown (2.5Y 4/4) mottles; very weak, coarse, prismatic structure to massive; firm; dark-gray (5Y 4/1) root channels; calcareous and contains calcium concretions three-eighths of an inch in diameter.

The surface layer ranges from 11 to 16 inches in thickness and from slightly acid to neutral in reaction. The subsoil is 20 to 30 inches thick. It ranges from slightly acid to mildly alkaline, and in many places it is calcareous in the lower part. Calcium concretions are common at a depth of less than 50 inches, though in some places these are lacking. In places a small amount of sand occurs throughout the profile. The amount of sand is not enough to change the textural class, but it is noticeable because of the high percentage of clay in the profile.

Darwin soils have more clay throughout the profile than Beaucoup soils. Their surface layer is thinner than that in the Wabash soils and is darker colored than that in the Karnak soils.

Darwin silty clay (71).—This soil has the profile described for the series. It is nearly level and is in shallow depressions and in sloughs on broad bottom lands. In the upper reaches of the bottoms, the areas are somewhat higher than areas of the deep, dark-colored Wabash soils. In the lower reaches of the bottoms, the areas are below the Karnak soils. All of the areas are fairly long and narrow and are fairly large.

Very slow permeability and occasional flooding are the main limitations of this soil. If farmed intensively, a dense, compact layer, or plowpan, forms in this soil. The soil also is wet. Drainage is needed for good growth of crops, and surface drains can be used to provide drainage. Use of tile for drainage is questionable. In places infestation by johnsongrass and wild cane also is a problem.

This soil is suited to most crops commonly grown in the county. Occasional flooding makes the growing of small grains risky. Including grasses and legumes in the cropping system, keeping tillage to a minimum, returning all crop residues to the soil, and use of other similar practices are ways of increasing permeability and improving tilth.

Lime generally is not needed, but if lime and fertilizer are applied and if management otherwise is good, the common crops grow well. Management group IIIw–5; woodland suitability group 11.

Darwin silt loam, overwash (71+).—This soil is nearly level and is on broad bottom lands. The areas generally are above areas of Darwin silty clay and below areas of Dupo silt loam, which is light-colored. Some areas, however, are between areas of Darwin silty clay and sloping, silty soils in the uplands and on terraces.

The surface layer is 15 to 30 inches thick because of overwash from higher lying areas. It generally is strongly acid to slightly acid. In a few places the overwash came from deep, silty soils on bluffs and is calcareous. Permeability is slow in the upper part of this soil, in the overwash, and very slow below, in the buried Darwin silty clay.

This Darwin soil is suited to most crops commonly grown in the county. Occasional flooding makes the growing of small grains risky. Because this soil is more silty than Darwin silty clay, preparing a seedbed is easier. Drainage is needed for good growth of crops, and surface drains can be used. Use of tile for drainage is questionable. Including grasses and legumes in the cropping system, keeping tillage to a minimum, and returning all crop residues to the soil increase permeability and improve tilth. If lime and fertilizer are applied, the common crops grow well. Management group IIIw–5; woodland suitability group 11.

Drury Series

In the Drury series are deep, nearly level to sloping, light-colored soils that are well drained. These soils are on foot slopes adjacent to strongly sloping to steep soils on bluffs near Shawneetown. They formed in silty material washed from adjacent silty soils on bluffs. The original vegetation was a forest of yellow-poplar, red oak, and black walnut.

In most places the surface layer is friable, dark-brown to brown silt loam about 7 inches thick. The subsoil has weak blocky structure and is about 30 inches thick. It consists of silt loam, and it is dark brown in the upper part and brown to strong brown in the lower part.

These soils have high available moisture holding capacity and are moderately permeable. They are medium acid to moderately alkaline and are medium in available phosphorus and potassium.

Representative profile of a Drury silt loam on a slope of about 2 percent, 140 feet south of the road and 40 feet east of a tree (NW10, NW40, NE160, sec. 14, T. 9 S., R. 9 E.):

Ap—0 to 7 inches, dark-brown to brown (10YR 4/3) silt loam; very soft, weak, crumb structure; friable; moderately alkaline; abrupt, smooth boundary.

B1—7 to 15 inches, dark-brown (7.5YR 4/4) silt loam; thin, patchy, dark-brown (7.5YR 4/2 to 4/4) coatings; weak, medium to coarse, subangular blocky structure; soft and floury; slightly acid; clear, smooth boundary.

B2—15 to 28 inches, dark-brown (7.5YR 4/4) silt loam; nearly continuous dark-brown (7.5YR 4/2 to 4/4) coatings on ped faces; weak, coarse, subangular blocky structure; soft and floury; slightly acid; clear, smooth boundary.

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B3—28 to 36 inches, brown (7.5YR 5/4) to strong-brown (7.5YR 5/6) silt loam; a few, thin, dark-brown (7.5YR 4/2 to 4/4) ped coatings and fillings in a few root channels; weak, coarse, subangular blocky structure to massive; soft and floury; slightly acid; gradual, smooth boundary.

C—36 to 55 inches, dark yellowish-brown (10YR 4/4) to yellowish-brown (10YR 5/6) silt loam; massive; neutral.

In color the surface layer ranges from brown and dark brown to dark yellowish brown. Subsoil development ranges from very slight to weak. Where development of the subsoil is moderate, the texture is light silty clay loam.

Drury soils are similar to Haymond soils, but their subsoil is weakly developed and the Haymond soils lack a developed subsoil.

Drury silt loam, 0 to 2 percent slopes (75A).—This soil has the profile described for the series. It is nearly level and is near more sloping, higher lying Drury soils. The areas are above areas of Worthen silt loam and of Jules silt loam.

Included with this soil are small areas of Worthen silt loam, which is dark colored and slightly acid, and of Jules silt loam, which is limy. Also included are some areas of Haymond silt loam, which is less well developed than this soil.

Most of this Drury soil has been cleared. This soil is well suited to intensive farming and is used mostly for that purpose. If lime and nitrogen and other fertilizer are applied as needed, all of the common crops grow well. Because this soil is highly fertile, infestation of johnsongrass is serious in some areas. Management group I–2; woodland suitability group 2.

Drury silt loam, 2 to 7 percent slopes (75B).—This soil generally is on foot slopes below strongly sloping to steep, silty soils on bluffs in the Shawneetown Hills and the Gold Hill areas near Shawneetown. Some narrow and wide areas, however, occupy irregular and concave slopes. The areas are between higher lying silty soils on the bluffs and lower lying Worthen silt loam and Shiloh silty clay. The surface layer ranges from dark brown, in the more nearly level areas, to dark yellowish brown in the more strongly sloping areas.

Included with this soil are small areas of the dark-colored Worthen silt loam and of the light-colored Alford and Jules soils. The Worthen soil is slightly acid, the Alford soils in these areas are shallow over calcareous material, and the Jules soil is calcareous in all layers.

In the more sloping areas of this Drury soil, erosion is a serious hazard. This soil can be farmed moderately intensively to intensively if measures are used for reducing runoff and controlling erosion. All of the common crops grow well if nitrogen and other fertilizer and lime are applied as needed. Management group IIe–1; woodland suitability group 2.

Dupo Series

Soils of the Dupo series are deep, nearly level to very gently sloping, light colored, and somewhat poorly drained. These soils are on bottom lands along the Saline River, Cane Creek, and Eagle Creek. They formed in silty sediment laid down on top of moderately dark colored to dark colored sediment that is moderately fine textured to fine textured. The native vegetation was a forest of various kinds of hardwoods.

The surface layer generally consists of about 16 inches of dark-brown to brown recently deposited silt loam. It overlies about 12 inches of dark-gray to dark grayish-brown silt loam, also recently deposited. Below is black to very dark brown silty clay loam.

These soils have high available moisture holding capacity and are moderately slowly permeable. They are medium acid to slightly acid, are low in available phosphorus, and are low to medium in available potassium.

Representative profile of Dupo silt loam on a slope of 0 to 2 percent (SW10, SE40, NW160, sec. 19, T. 10 S., R. 9 E.):

A1—0 to 16 inches, dark-brown to brown (10YR 4/3) silt loam; weak, fine, crumb structure; friable; medium acid; clear, smooth boundary.

Cl—16 to 28 inches, dark-gray (10YR 4/1) to dark grayish-brown (10YR 4/2) silt loam; massive; friable; medium acid; abrupt, smooth boundary.

IIAb—28 to 43 inches, black (10YR 2/1) to very dark brown (10YR 2/2) light silty clay loam; weak to moderate, fine and medium, subangular blocky structure; firm; medium acid; clear, smooth boundary.

IIC2—43 to 52 inches +, very dark brown (10YR 2/2 to 2/3) silty clay loam; massive; firm; a few iron and manganese concretions; neutral.

The recently deposited silty sediment in which Dupo soils formed ranges from 15 to 40 inches in thickness. Reaction ranges from medium acid to slightly acid.

Dupo soils are similar to the Belknap and Wakeland soils, but unlike them, are underlain by moderately dark colored to dark colored, moderately fine textured material.

Dupo silt loam (180).—This is the only Dupo soil mapped in the county. It is nearly level and very gently sloping. The areas generally are on bottom lands between level, deep, silty Belknap and Wakeland soils and moderately dark colored to dark colored Beaucoup and Darwin soils. Some areas, however, are on bottom lands below sloping Alford and Hosmer soils and above Beaucoup and Darwin soils.

Included with this soil are small areas of Beaucoup, Belknap, Darwin, and Wakeland soils that have a deposit of silt loam on them.

If lime, fertilizer, and supplemental nitrogen are applied as needed, this Dupo soil is suited to all crops commonly grown in the county. Occasional flooding and slow movement of water into the soil, causing slight wetness, are the main limitations. Drainage is needed, and tile can be used but drains the soil slowly. Management group IIw-4; woodland suitability group 9.

Emma Series

In the Emma series are deep, nearly level to moderately sloping, moderately dark colored soils that are moderately well drained. These soils are along the Ohio River on broad, long areas that are slightly elevated. They formed in 60 or more inches of acid silty clay loam material. The vegetation was a mixed stand of trees consisting of black oak, pin oak, and ash.

The surface layer typically is friable silty clay loam that has blocky structure and is about 8 inches thick. It is very dark grayish brown in the upper part and dark grayish brown and brown in the lower part. The subsoil is silty clay loam that is mixed brown and dark yellowish brown in the upper part and yellowish brown below. It has subangular blocky structure to a depth of 28 inches. Mottles in the subsoil are yellowish brown to a depth of 23 inches and brown to dark brown and light brownish gray below. The subsoil is about 50 inches thick.

These soils have high available moisture holding capacity and are slowly permeable to moderately slowly permeable. They are slightly acid to very strongly acid, are low in available phosphorus, and are about medium in available potassium.

A representative profile of an Emma silty clay loam on a slope of about 1 percent, 15 feet north of an old lane, and 250 feet east of a gravel road (SE10, SW40, NW160, sec. 27, T. 8 S., R. 10 E.):

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) silty clay loam; moderate, medium, subangular blocky structure; friable; slightly acid; abrupt, smooth boundary.

A2—4 to 8 inches, mixed dark grayish-brown (10YR 4/2) and brown (10YR 4/3 and 5/3) silty clay loam; weak, medium, subangular blocky structure; friable; strongly acid; clear, smooth boundary.

B1—8 to 14 inches, mixed brown (10YR 4/3) and dark yellowish-brown (10YR 4/4) silty clay loam; a few, medium, faint, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; strongly acid; clear, smooth boundary.

B21—14 to 23 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, faint, dark yellowish-brown (10YR 4/4) mottles; moderate, medium to coarse, subangular blocky structure; firm; in the upper part are many, thin to moderately thin, dark yellowish--brown (10YR 4/4) clay coatings and continuous, thick, brown (10YR 5/3) silt coatings; very strongly acid; clear, smooth boundary.

B22—23 to 28 inches, yellowish-brown (10YR 5/4) silty clay loam; a few, fine, faint, brown to dark-brown (7.5YR 4/4) mottles; some pale-brown (10YR 6/3) silt coatings; weak to moderate, medium, subangular blocky structure; firm; very strongly acid; clear, smooth boundary.

B23—28 to 44 inches, yellowish-brown (10YR 5/4) silty clay loam; a few, fine, faint, brown to dark-brown (7.5YR 4/4) mottles; some light brownish-gray (10YR 6/2) silt coatings; weak, coarse, prismatic structure that breaks to weak, medium, subangular blocky; firm; very strongly acid; clear, smooth boundary.

B3—44 to 58 inches, yellowish-brown (10YR 5/4) silty clay loam; many, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, coarse, prismatic structure; firm; continuous light brownish-gray (10YR 6/2) silt coatings in the upper part that become patchy in the lower part; very strongly acid; diffuse, smooth boundary.

C—58 to 72 inches +, light brownish-gray (10YR 6/2) coarse silty clay loam; many, distinct, yellowish-brown (10YR 5/4) mottles; massive.

The subsoil generally ranges from 45 to 55 inches in thickness, but in places it is as thin as 36 inches. Silt coatings in the subsoil are more prominent where the subsoil is 50 inches thick than where the subsoil is only 36 inches thick.

Emma soils are similar to the Sciotoville soils but have a more clayey surface layer and lack a fragipan.

Emma silty clay loam, 0 to 2 percent slopes (469A).—This soil has the profile described for the series. It is on very low, long, broad terraces above nearby areas of Tice silty clay loam and below nearby areas of Sciotoville silt loams.

Included with this soil are small areas of Tice silty clay loam, which is somewhat poorly drained. Also included are some small areas of soils that have coarse-textured material at a depth of less than 40 inches.

Under good management, which includes adding lime and fertilizer, this Emma soil is moderately well suited to corn, soybeans, and other summer crops. Slow to moderately slow permeability and flooding are the main limitations. Returning all crop residues to the soil, keeping tillage to a minimum, adding a complete fertilizer, and similar practices are needed for increasing permeability and improving tilth. Management group IIw–1; woodland suitability group 9.

Emma silty clay loam, 2 to 6 percent slopes (469B).—This soil is on very low terraces that are broad and long. It occupies areas above nearby poorly drained Karnak soils and nearly level Emma soils. The subsoil, which is about 40 inches thick, is thinner than that in the profile described for the series. The erosion hazard is slight.

Included with this soil are small areas of poorly drained Karnak soils. Also included are some small areas of other Emma soils and of well-drained soils that have coarse-textured material at a depth of 40 inches.

Under good management, which includes adding lime and fertilizer, this Emma soil is suited to corn, soybeans, and other summer crops. Slow to moderately slow permeability, hazard of flooding, and slopes are the chief limitations. Permeability can be increased and tilth improved if all crop residues are returned to the soil, tillage is kept to a minimum, and other good management is used. Including grasses and legumes in the cropping system is a way to control erosion. Management group IIe–2; woodland suitability group 9.

Emma silty clay loam, 7 to 12 percent slopes, eroded (469D2).—This soil occupies short slopes in long, irregular areas. The areas are between nearly level Emma soils and lower lying, poorly drained Karnak soils.

Included with this soil are some small areas of other Emma soils. Also included are small areas of poorly drained Karnak soils.

Flooding, slow to moderately slow permeability, slopes, and the hazard of further erosion severely limit use of this soil for cultivated crops. The flooding hazard also severely limits production of hay or pasture. Growing grasses in the cropping system for most of the time reduces loss of soil and water, improves tilth, and increases permeability. If lime and fertilizer are applied, the grasses grow well but growth of grain is poor. Management group IVe–3; woodland suitability group 9.

Harco Series

Harco soils are deep, nearly level, dark colored, and somewhat poorly drained. These soils are on terraces in the north-central part of the county. They formed under grasses in silty glacial material of Wisconsin age.

The surface layer generally consists of silt loam about 14 inches thick. It is very dark gray in the upper part and black or very dark gray in the lower part. Just below is very dark gray fine silt loam about 3 inches thick. The subsoil is grayish-brown, mottled light olive-brown and yellowish-brown silty clay loam. It is about 22 inches thick and has blocky or prismatic structure.

These soils have very high available moisture capacity and are moderately permeable to moderately slowly permeable. They are slightly acid to neutral, medium to low in available phosphorus, and medium to high in available potassium.

Representative profile of Harco silt loam on a slope of about 1 percent, 100 feet north of a road extending from east to west and 300 feet east of the center of a road extending from north to south (NW40, SW160, sec. 35, T. 7 S., R. 9 E.):

Ap—0 to 9 inches, very dark gray (10YR 3/1) silt loam; weak, fine, crumb structure; friable; many roots; common, fresh worm casts; neutral; abrupt, smooth boundary.

A1—9 to 14 inches, black (10YR 2/1) silt loam that is very dark gray (10YR 3/1) when crushed; weak to moderate, medium, crumb structure; friable; many roots and a few small iron concretions; neutral; gradual, smooth boundary.

A3—14 to 17 inches, very dark gray (10YR 3/1) heavy silt loam; common, fine, distinct, olive-brown (2.5Y 4/4) mottles; weak, medium, subangular blocky structure that breaks to weak, fine, subangular blocky; firm; many roots and a few small iron concretions; neutral; clear, smooth boundary.

B21t—17 to 23 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, fine, distinct, yellowish-brown (10YR 5/4 and 5/6) mottles; moderate, medium, subangular blocky structure; thick, very dark gray (10YR 3/1) clay films; firm; common iron and manganese concretions and roots; neutral; clear, smooth boundary.

B22t—23 to 31 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, fine, prominent, yellowish-brown (10YR 5/6) to light olive-brown (2.5Y 5/6) mottles; weak, medium, prismatic structure that breaks to moderate, medium to coarse, subangular blocky; continuous, thick, very dark gray (10YR 3/1) clay films; firm; common roots and a few iron and manganese concretions; neutral; gradual, smooth boundary.

B3—31 to 39 inches, olive-gray (5Y 5/2) light silty clay loam; common, medium, prominent, dark yellowish-brown (10YR 4/4) to yellowish-brown (10YR 5/6) mottles; weak, medium, prismatic structure that breaks to weak, medium, subangular blocky; clay coatings that are dark grayish brown (2.5Y 4/2) and nearly continuous on vertical ped faces and discontinuous on horizontal ped faces; firm to friable; a few to common roots and a few small iron and manganese concretions; neutral; gradual, smooth boundary.

C1—39 to 49 inches, mixed grayish-brown (2.5Y 5/2), light olive-brown (2.5Y 5/4), and yellowish-brown (10YR 5/6) heavy silt loam; massive; common, fine, very dark gray (10YR 3/1) coatings in root channels; friable; a few small iron and manganese concretions; calcareous; diffuse, smooth boundary.

C2—49 to 61 inches +, yellowish-brown (10YR 5/6) silt loam; common, medium, distinct, light olive-brown (2.5Y 5/3) mottles; massive; friable; calcareous.

In thickness the surface layer ranges from 12 to 18 inches, and the subsoil, from 20 to 36 inches. The C horizon generally is at a depth of less than 40 inches and is calcareous at a depth of less than 50 inches.

Harco soils are darker colored than Reesville soils. They lack the dark-gray subsurface layer that is typical of the Marissa soils.

Harco silt loam (484).—This is the only Harco soil mapped in the county. It is nearly level and is on broad terraces. The areas are slightly higher than surrounding areas of Marissa silt loam and are somewhat lower than the nearby light-colored, somewhat poorly drained Reesville soils.

Included with this soil are small areas of Marissa silt loam, which has a dark-gray subsurface layer, and of Patton silty clay loam, which is poorly drained. Also included are some soils that have a cover of dark grayish-brown silt loam, 10 to 24 inches thick, that has been washed onto the original surface layer from nearby areas.

Harco silt loam is well suited to all crops commonly grown in the county, and most of it is farmed intensively. Practices needed are returning all crop residues to the soil and keeping tillage to a minimum. Lime generally is not needed, but phosphorus and potassium should be applied as needed. Management group I-1; not assigned to a woodland suitability group.

Harpster Series

Soils of the Harpster series are deep, level, dark colored, and very poorly drained. These soils are on low terraces along Cypress Ditch. They formed under grasses and swamp vegetation in clayey material settled out in quiet water.

The surface layer typically is very dark gray silty clay loam about 18 inches thick. It overlies dark-gray silty clay loam that is mottled with brown to dark brown and has prismatic or blocky structure. Snail shells and shells of similar animals are in all layers.

These soils have high available moisture supplying capacity and are moderately slowly permeable. They are calcareous and are low in available phosphorus and potassium. Their content of organic matter is high. Harpster soils are subject to flooding.

Representative profile of Harpster silty clay loam on a slope of less than 1 percent (SE. corner, sec. 19, T. 9 S., R. 9 E.):

Ap—0 to 7 inches, very dark gray (10YR 3/1) medium silty clay loam that contains some grit; massive; firm; snail shells throughout the horizon; violently effervescent; abrupt, smooth boundary.

A11—7 to 12 inches, very dark gray (10YR 3/1) medium silty clay loam that contains some grit; a few, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; weak, coarse, subangular blocky structure that breaks to moderate, medium, granular; friable to firm; shells throughout the horizon; strongly effervescent; diffuse, smooth boundary.

A12—12 to 18 inches, dark-gray (2.5Y 4/1) to very dark gray (2.5Y 3/1) medium silty clay loam that contains some grit; a few, fine, distinct, dark yellowish-brown (10YR 3/4) mottles; weak to moderate, medium, angular blocky structure; firm; shells throughout the horizon; strongly effervescent; diffuse, smooth boundary.

Blg—18 to 30 inches, dark-gray (2.5Y 4/1) medium silty clay loam that contains some grit; a few, fine to coarse, distinct, brown to dark-brown (10YR 4/3) mottles; weak, medium to coarse, prismatic structure that breaks to weak, medium, angular blocky; firm; shells throughout the horizon; a few iron concretions; strongly effervescent; diffuse, smooth boundary.

B2g—30 to 45 inches, dark-gray (2.5Y 4/1) medium silty clay loam that contains some grit; a few, fine to coarse, distinct, brown to dark-brown (10YR 4/3) mottles; weak, coarse, angular blocky structure; firm; shells throughout the horizon; a few iron concretions; strongly effervescent; diffuse, smooth boundary.

Clg—45 to 70 inches, dark-gray (2.5 4/1) medium silty clay loam that contains some grit; a few, fine to coarse, distinct, brown to dark-brown (10YR 4/3) mottles; massive; firm; shells throughout the horizon; a few iron concretions; strongly effervescent; clear, smooth boundary.

IIC2—70 to 80 inches +, mixed gray (5Y 5/1) and olive (5Y 5/4) stratified sandy clay loam and sandy loam; the sandy clay loam is massive and the sandy loam is single grain; strongly effervescent.

In texture the surface layer ranges from silty clay loam to loam. The number of snail shells in the surface layer ranges between few and many.

Harpster soils are similar to Sawmill soils but have snail shells throughout the profile.

Harpster silty clay loam (67).—This is the only Harpster soil mapped in the county. It is nearly level and generally occupies flat to depressional areas on terraces along Cypress Ditch, near the town of Junction. In places the areas are slightly elevated and are between the lower lying Wabash silty clay and the higher lying McGary silt loams. The areas range from 1 to 15 acres in size.

Included with this soil are small areas of Wabash silty clay, which lacks snail shells, and of Wallkill silty clay loam, wet, which is shallow to muck, peat, or sand. Also included are a few small areas that are sandy loam throughout all layers.

The main limitations of Harpster silty clay loam are wetness and flooding. If fertilizer is applied as needed, however, and later if supplemental nitrogen is added, all of the common crops except small grains grow well. Because of the high content of lime, plants on this soil do not respond well to ground rock phosphate fertilizer. Artificial drainage is needed if this soil is farmed intensively, and tile can be used to provide drainage. Management group IIw-5; woodland suitability group 11.

Haymond Series

In the Haymond series are deep, nearly level to gently sloping, light-colored soils that are well drained. These soils are in the southern part of the county on narrow bottom lands that extend into strongly sloping and steep soils in the uplands. They formed from recently deposited silty material.

These soils generally are dark yellowish-brown to dark-brown silt loam to a depth of 50 inches or more and have very weak crumb structure. They are very friable and are easy to till.

Haymond soils have very high available moisture holding capacity and are moderately permeable. They are slightly acid to mildly alkaline, are low to medium in available phosphorus, and are medium in available potassium.

Representative profile of Haymond silt loam on slopes of 0 to 2 percent (NW10, SE40, NE160, sec. 35, T. 9 S., R. 9 E.):

Ap—0 to 6 inches, dark yellowish-brown (10YR 4/4) silt loam; very weak, fine, crumb structure; very friable; neutral; abrupt, smooth boundary.

C1—6 to 16 inches, dark yellowish-brown (10YR 4/4) silt loam; very weak, fine, crumb structure; very friable; mildly alkaline; clear, smooth boundary.

C2—16 to 18 inches, dark yellowish-brown to yellowish-brown (10YR 4/4 to 5/6) silt loam; very weak, medium, crumb structure; very friable; mildly alkaline; clear, smooth boundary.

C3—18 to 32 inches, dark-brown to brown (10YR 4/3) silt loam; very weak, medium, crumb structure; very friable; mildly alkaline; gradual, smooth boundary.

C4—32 to 42 inches, dark-brown to brown (10YR 4/3) silt loam; common yellowish-brown (10YR 5/4) mottles; very weak, medium, crumb structure; very friable; mildly alkaline; gradual, smooth boundary.

C5—42 to 50 inches, dark-brown (10YR 3/3) silt loam; very weak, medium, crumb structure; very friable; mildly alkaline.

The surface layer ranges from brown to dark yellowish brown and from medium acid to mildly alkaline.

Haymond soils are similar to Drury soils, but they lack a developed subsoil and the Drury soils have a weakly developed subsoil. They are also similar to the Wakeland soils, but they are well drained and the Wakeland soils are somewhat poorly drained.

Haymond silt loam (331).—This is the only Haymond soil mapped in the county. Some areas are small and nearly level and are adjacent to small drainageways. Other areas are very gently sloping to gently sloping and are in the southern part of the county on bottom lands that extend into strongly sloping to steep soils in the uplands. This soil occupies somewhat higher areas than the nearby Wakeland silt loam.

Included with this soil are small areas of the weakly developed Drury soils, of the somewhat poorly drained Wakeland silt loam, and of Jules silt loam, which is limy. Also included are some areas of moderately well drained soils.

This Haymond soil is suited to intensive farming. All of the common crops can be grown. The soil is subject to occasional flooding after a severe rainstorm, but the floodwater remains for only a short time, and deposition of silt on plants is the only damage. All of the common crops grow well if lime and nitrogen and other fertilizer are applied. Management group I–2; woodland suitability group 9.

Hickory Series

The Hickory soils are deep, moderately sloping to moderately steep, light colored and moderately well drained to well drained. These soils are in the uplands in the northwestern corner of the county on slopes near bottom lands and along watercourses. They formed in Illinoian glacial till that had a cover of windblown silty material, or loess, less than 18 inches thick. Erosion has removed all or most of the loess cover. The native vegetation was a forest consisting chiefly of oak and hickory.

The surface layer generally is mixed dark grayish-brown and dark yellowish-brown loam about 4 inches thick. The subsoil is clay loam and is about 39 inches thick. It is dark brown to strong brown in the upper part and yellowish brown to dark yellowish brown in the lower part. Its structure is blocky. The underlying substratum is dark yellowish-brown glacial till.

These soils have high to moderate available moisture capacity and are moderately permeable. They are strongly acid to very strongly acid, are low in available phosphorus, and are low to medium in available potassium.

Representative profile of a Hickory loam on a slope of 20 percent, 650 feet south of entrance to a field on State Route 141 (SE2½, NW10, NW40, NE160, sec. 20, T. 7 S., R. 8 E.):

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

B1—4 to 7 inches, dark-brown (7.5YR 4/4) to strong-brown (7.5YR 5/6) clay loam; weak, fine and very fine, subangular blocky structure; friable to firm; very strongly acid; clear, smooth boundary.

B21t—7 to 13 inches, dark-brown (7.5YR 4/4) clay loam; moderate, fine and medium, subangular blocky structure; light-brown (7.5YR to 10YR 6/4) silt coatings on peds that are not noticeable when wet; firm; very strongly acid; clear, smooth boundary.

B22t—13 to 26 inches, yellowish-brown (10YR 5/4) to dark yellowish-brown (10YR 4/4) clay loam; a few, fine, distinct, yellowish-red (5YR 4/6) mottles; moderate to strong, medium, subangular blocky structure; continuous dark-brown (7.5YR 4/4) clay films on peds; firm; very strongly acid; gradual, smooth boundary.

B23t—26 to 33 inches, dark yellowish-brown (10YR 4/6) clay loam; a few, fine, distinct, gray (10YR 6/1) mottles; moderate, medium and coarse, subangular blocky structure; nearly continuous dark-brown (7.5YR 4/4) clay films on peds; firm; very strongly acid; gradual, smooth boundary.

B3—33 to 43 inches, dark yellowish-brown (10YR 4/4) clay loam; a few, medium, distinct, strong-brown (7.5YR 5/6) mottles and a few, fine, distinct, gray (10YR 6/1) mottles; weak to moderate, coarse, angular blocky structure; discontinuous dark-brown (7.5YR 4/4) clay films; some black (10YR 2/1) streaks along old root channels; firm; medium acid; gradual, smooth boundary.

C—43 to 49 inches +, dark yellowish-brown (10YR 4/4) loam; a few, medium, distinct, strong-brown (7.5YR 5/6) mottles and a few, fine, distinct, gray (10YR 6/1) mottles; weak, very coarse, angular blocky structure; some black (10YR 2/1) streaks along old root channels; firm to friable; slightly acid.

The surface layer ranges from silt loam to loam, depending upon the presence or absence of loess. Where the soil is severely eroded, the surface layer is clay loam in texture. The thickness of the surface layer ranges from less than 1 inch to 10 inches. The C horizon generally is slightly acid but in places ranges from strongly acid to neutral. Its color ranges from yellowish brown to strong brown.

Hickory soils are similar to the Ava soils, but unlike them, lack a dense impermeable layer, or fragipan, and have a thinner cover of loess.

Hickory loam, 4 to 10 percent slopes, eroded (8C2).—This soil generally is in the upper part of draws that extend into less sloping upland areas. In most places the areas are below the Ava and Bluford soils and above the Belknap and Bonnie soils. The surface layer is 3 to 7 inches thick in most places, but in a few small areas the surface layer is lacking.

Included with this soil are some areas of Ava soils, which have a fragipan, and of Bluford soils, which are somewhat poorly drained. Also included are small areas of somewhat poorly drained soils on mottled glacial till that have a cover of loess less than 20 inches thick.

Much of this Hickory soil is farmed. The low fertility and slopes make the soil subject to further erosion. Because the areas are fairly small, management is difficult. Including grasses and legumes in the cropping system is a way of preventing further erosion. If lime and fertilizer are applied, growth of the common grain crops is moderate and that of grasses and legumes is good. Management group IIe–2; woodland suitability group 5.

Hickory soils, 7 to 12 percent slopes, severely eroded (8D3).—Some areas of these soils are in draws that extend into areas of less sloping Bluford soils. Other areas are on long, narrow slopes above Belknap silt loam, on bottom lands, and below fairly level Ava and Bluford soils.

The surface layer is yellowish brown, and because of erosion, it is more clayey than that in the profile described for the series. It ranges from silt loam to clay loam in texture, is less than 3 inches thick, and in many places is lacking.

Included with these soils are small areas of Ava soils, which have a fragipan, and of Bluford soils, which are somewhat poorly drained and are eroded. Also included are some areas of strongly sloping Hickory soils and small areas of somewhat poorly drained soils on mottled glacial till, where the cover of loess is less than 20 inches thick.

Many areas of these Hickory soils have been used for the crops commonly grown in the county, but these soils are not suited to intensive cropping. Runoff is rapid, and the hazard of further erosion is serious. Installing terraces, diversions, and similar measures for the control of erosion is difficult. Also, the clayey surface layer makes preparing a seedbed difficult. If lime and fertilizer are applied, growth of the common crops is moderate and growth of legumes and grasses is moderate to good. Management group IVe–2; woodland suitability group 5.

Hickory soils, 12 to 18 percent slopes, severely eroded (8E3).—These soils are on long, narrow slopes above Belknap and Bonnie soils, on bottom lands, and below fairly level Ava and Bluford soils, in the uplands.

The surface layer is dark brown, and because of erosion, it is more clayey than that in the profile described for the series. It ranges from silt loam to clay loam in texture, is less than 3 inches thick, and in many places is lacking. Fertility and content of organic matter are less than in the original surface layer and tilth is poorer.

Included with these soils are small areas of Ava soils, which have a fragipan, and of Bluford soils, which are somewhat poorly drained and are eroded. Also included are some areas of less eroded Hickory soils that are moderately steep to steep or are moderately sloping.

These Hickory soils are better suited to pasture or woodland than to other uses. The hazard of further erosion is serious. Runoff is rapid, and the supply of moisture available for plants therefore is only moderate. Installing terraces, diversions, and similar measures for the control of erosion is difficult. Also, the clayey surface layer makes preparing a seedbed difficult. Management group VIe–1; woodland suitability group 5.

Hickory loam, 18 to 30 percent slopes, eroded (8F2).—This soil has the profile described for the series. It is on long, narrow slopes above Belknap and Bonnie soils, on bottom lands, and below fairly level Ava and Bluford soils, in the uplands.

Included with this soil are small areas of Ava soils, which have a fragipan. Also included are some areas of Hickory soils that are strongly sloping and severely eroded.

Most of this Hickory soil is wooded, though a few small areas have been cleared. Because of the slopes, the hazard of further erosion is severe unless trees, grasses, or other cover is kept on the areas. This soil is better suited to woodland or pasture than to cultivated crops. Growth of tilled crops is poor even if adequate amounts of lime and fertilizer are applied, but growth of pasture is moderate. Management group VIe–1; woodland suitability group 5.

Hosmer Series

In the Hosmer series are very gently sloping to strongly sloping, light-colored soils that are moderately well drained. These soils have a fragipan. They are on ridgetops and slopes in the gently rolling and rolling western and southwestern parts of the county. Hosmer soils formed in windblown silty material, or loess. The loess was more than 50 inches thick over loam or clay loam Illinoian till or material weathered from sandstone. The vegetation was a forest consisting of oak and hickory trees.

In most places the surface layer ranges from 8 to 14 inches in thickness. It is brown and granular in the upper part and brown to strong brown and platy in the lower part. The subsoil is dark-brown to strong-brown silt loam to light silty clay loam and has blocky structure. Depth to the fragipan is about 30 inches.

These soils have moderate available moisture holding capacity. The layers above the fragipan are moderately permeable to moderately slowly permeable, and the fragipan is slowly permeable. Hosmer soils are strongly acid to very strongly acid. They are low in available phosphorus and are about medium in available potassium.

Representative profile of a Hosmer silt loam on a slope of about 2 percent, 27 feet south of the right-of-way of Illinois Highway 141, and 85 feet west of the center of a township road going southward (NE10, NE40, NE160, sec. 24, T. 7 S., R. 8 E.):

Ap—0 to 8 inches, brown (10YR 5/3 to 4/3) silt loam; very weak, fine and medium, granular structure; friable; many small roots and worm casts; medium acid; abrupt, smooth boundary.

A2—8 to 13 inches, brown to strong-brown (7.5YR 5/4 to 5/6) silt loam; very weak, thick, platy structure to weak, fine, subangular blocky; friable when moist; many, small, dark-brown worm casts; strongly acid; abrupt, smooth boundary.

B1—13 to 23 inches, dark-brown to brown (7.5YR 4/4 to 5/4) silt loam; moderate, fine and medium, subangular blocky structure; friable; thin coating of brown (10YR 5/3) on a few ped faces; strongly acid; clear, wavy boundary.

B2—23 to 30 inches, strong-brown (7.5YR 5/6) silt loam to light silty clay loam; strong, coarse and very coarse, subangular blocky structure; very weak, medium, prismatic structure; firm; common dark-brown to brown (7.5YR 4/4 to 5/4) clay skins; a few, thin, light-gray (10YR 7/2) coatings, root channels, and crack fillings; very strongly acid; clear, wavy boundary.

A'2Bx—30 to 34 inches, strong-brown (7.5YR 5/6) heavy silt loam; weak, medium and coarse, prismatic structure that breaks to weak to moderate, coarse and very coarse, angular blocky; firm; many pale-brown (10YR 6/3) vertical and horizontal cracks, streaks, and coatings that make up about 25 percent of the horizon color; a few, thin, very dark brown (10YR 2/2) coatings and streaks; the strong-brown material is brittle when dry and represents the upper part of the fragipan; very strongly acid; clear, wavy boundary.

B'x1—34 to 45 inches, strong-brown (7.5YR 5/6) heavy silt loam; massive to very weak, coarse, blocky structure; firm; pale-brown (10YR 6/3) coatings and vertical crack fillings; the cracks are as much as one-eighth of an inch in diameter; a few, thin, dark-brown (7.5YR 4/4) clay skins; very strongly acid; gradual, wavy boundary.

B'x2—45 to 61 inches, brown (7.5YR 4/4 to 5/4) silt loam; massive to very weak, very coarse, prismatic structure; firm, cracks filled with pale-brown (10YR 6/3) material that is gray (10YR 6/1) when dry; the number of cracks decreases with depth; a few dark-brown (7.5YR 4/4 to 4/2) clay skins; common very dark brown (10YR 2/2) streaks and thin coatings; strongly acid; diffuse, wavy boundary.

B'x3—61 to 79 inches, brown (7.5YR 4/4 to 5/4) silt loam; massive to very weak, very coarse, prismatic structure; firm; pale-brown (10YR 6/3) streaks and crack fillings; cracks are as much as one-fourth of an inch in diameter and decrease in number with depth; this horizon is mainly loess that has a noticeable increase, with depth, of very fine sand; a few small pebbles; medium acid; diffuse, wavy boundary.

C—79 inches, reddish-brown (5YR 4/4) silt loam; massive; firm; a few streaks of light brownish-gray (10YR 6/2) about 12 inches apart; material consists of largely weathered till; medium acid.

The texture of the surface layer is silt loam in uneroded and moderately eroded areas, but it is light silty clay loam to silty clay loam in severely eroded areas. In thickness the surface layer ranges from less than 1 to about 14 inches. The color of the subsoil ranges from dark brown to yellowish brown.

Hosmer soils are similar to Ava soils, but they formed entirely in loess. Ava soils formed partly in loess and partly in underlying glacial till. Hosmer soils are also somewhat similar to the Zanesville soils but unlike them, formed in loess more than 50 inches thick. Zanesville soils formed in loess less than 40 inches thick.

Hosmer silt loam, 1 to 4 percent slopes (214B).—This soil has the profile described for the series. It is on ridgetops and on slope breaks. On the ridgetops it generally is surrounded by more strongly sloping Hosmer soils. The other areas are narrow, long, and irregular and are between nearly level Stoy soils and more strongly sloping Hosmer soils.

Included with this soil are small areas of gently sloping Hosmer soils and of nearly level, somewhat poorly drained Stoy soils. Also included are some moderately eroded Hosmer soils that have less than 7 inches of their original surface layer remaining and are yellowish brown to strong brown in color. Here the surface layer is very low in content of organic matter and crusts readily after a moderate rain.

The main limitations of this Hosmer soil are slight hazard of erosion, slow movement of water in the fragipan, and moderate available water holding capacity. Diversions, farming on the contour, and similar conservation measures can be used to reduce losses of soil and water. Under good management the soil is well suited to the commonly grown grain crops and moderately well suited to hay and pasture. Good management consists of growing grasses and legumes in the cropping system, returning all crop residues to the soil, applying lime and fertilizer, and keeping tillage to a minimum. Management group IIe–3; woodland suitability group 4.

Hosmer silt loam, 4 to 7 percent slopes (214C).—This soil is on ridges and other gently sloping areas. On the ridgetops it generally is surrounded by more strongly sloping Hosmer soils. The other areas generally are between higher lying, nearly level Hosmer soils and lower lying, more strongly sloping Hosmer soils that are moderately eroded or are severely eroded.

Included with this soil are small areas of nearly level Hosmer soils. Also included are some small areas of soils that have similar slopes but are moderately eroded.

The main limitations of this soil are hazard of erosion, slow movement of water in the fragipan, and moderate available water holding capacity. Contour farming, terraces or diversions, and similar practices can be used to reduce loss of water and control erosion. Under good management the soil is well suited to the common grain crops and moderately well suited to hay and pasture. Good management consists of growing grasses and legumes in the cropping system, returning all crop residues to the soil, applying lime and fertilizer, and keeping tillage to a minimum. Management group IIIe–5; woodland suitability group 4.

Hosmer silt loam, 4 to 7 percent slopes, eroded (214C2).—This soil is in waterways and in other gently sloping areas. Several inches of the original surface layer have been eroded away. The present surface layer is yellowish brown to strong brown and is less than 7 inches thick. It is more clayey in places than that in the profile described for the series. The content of organic matter is lower, tilth is poorer, and less water moves into the soil and is held for crops. The present surface layer also erodes easily and crusts readily after a rainstorm. The crusting hinders emergence of seedlings.

Included with this soil are small areas of less sloping Hosmer soils and of more strongly sloping Hosmer soils. Also included are some areas of soils that have a very weak fragipan or that lack a fragipan.

The main limitations of this Hosmer soil are hazard of further erosion, slow movement of water in the fragipan, and moderate available water holding capacity. Under good management that controls erosion, reduces loss of water, and improves tilth, this soil is fairly well suited to the common grain crops and moderately well suited to hay and pasture. Good management consists of applying lime and fertilizer, growing grasses and legumes in the cropping system, returning all crop residues to the soil, keeping tillage to a minimum, and similar practices. Management group IIIe–5; woodland suitability group 4.

Hosmer soils, 4 to 7 percent slopes, severely eroded (214C3).—Some areas of these soils are in waterways, and other areas are on narrow, irregular slope breaks. The areas are between very gently sloping, less eroded Hosmer soils and more strongly sloping Hosmer soils or nearly level, somewhat poorly drained Wakeland silt loam.

Most, and in many places all, of the original surface layer has been eroded away. The present surface layer is yellowish-brown to strong-brown silt loam to heavy silt loam that is less than 3 inches thick. It contains more clay than that in the profile described for the series. Runoff and the hazard of erosion therefore are greater and less water moves into the soil and is held available for crops. In addition, preparing a seedbed is more difficult and rooting depth above the fragipan is more limited.

Included with these soils are small areas of other Hosmer soils. Also included are some areas of soils that have a weak fragipan or that lack a fragipan.

The main limitations of these Hosmer soils are severe hazard of further erosion, slow movement of water in the fragipan, and low water-holding capacity. Because of the irregular slopes, it is difficult to farm on the contour, install terraces and diversions, and apply other measures for the control of erosion. Even if good management is used, the soils are only poorly suited to row crops and only moderately well suited to hay and pasture (fig. 11). Good management that helps to control erosion, reduce water loss, and improve tilth consists of adding lime and fertilizer and growing grasses and legumes in the cropping system most of the time. It also includes returning all crop residues to the soil and keeping tillage to a minimum. Management group IVe–4; woodland suitability group 4.

Figure 11.—**Unimproved pasture on Hosmer soils, 4 to 7 percent slopes, severely eroded; applying measures for control of erosion is difficult on these soils.**

Hosmer silt loam, 7 to 12 percent slopes (214D).—Some areas of this soil are in waterways or are on narrow ridgetops. Other areas occupy narrow, irregular slopes. The areas are between gently sloping, less eroded Hosmer soils and more strongly sloping Hosmer soils or nearly level, somewhat poorly drained Wakeland silt loam.

Incuded with this soil are some small areas of other Hosmer soils.

The main limitations of this soil are hazard of erosion, slow movement of water in the fragipan, and moderate available water-holding capacity. Contour farming, terraces or diversions, and similar practices can be used to reduce water loss and control erosion. Under good management the soil is well suited to the common grain crops and is moderately well suited to hay and pasture. Good management consists of growing grasses and legumes in the cropping system, returning all crop residues to the soil, applying lime and fertilizer, and keeping tillage to a minimum. Management group IIIe–5; woodland suitability group 4.

Hosmer silt loam, 7 to 12 percent slopes, eroded (214D2).—This soil is in waterways or is on narrow, irregular slopes. The areas generally are between gently sloping, less eroded Hosmer soils and more strongly sloping Hosmer soils or nearly level, somewhat poorly drained Wakeland silt loam. Some narrow areas are between less sloping Hosmer soils and strongly sloping Zanesville soils that are less than 40 inches thick over sandstone.

Several inches of the original surface layer of this soil have been eroded away. The present surface layer is yellowish brown to strong brown and less than 7 inches thick. It is more clayey in places than that in the profile described for the series. The content of organic matter is lower, tilth is poorer, and less water moves into the soil and is held available for crops. The present surface layer also erodes easily and crusts readily after a rainstorm.

Included with this soil are small areas of other Hosmer soils. Also included are some small areas of Zanesville soils that are less than 40 inches thick over sandstone.

The main limitations of this Hosmer soil are hazard of further erosion, slow movement of water in the fagipan, and moderate available water-holding capacity. If erosion is controlled, loss of water reduced, and tilth improved, the soil is moderately well suited to the common grain crops and is well suited to hay and pasture. Practices needed are applying lime and fertilizer, growing grasses and legumes in the cropping system, returning all crop residues to the soil, and keeping tillage to a minimum. In the southwestern part of the county, waterways may be difficult to establish because sandstone is exposed in some gullies. Management group IIIe–5; woodland suitability group 4.

Hosmer soils, 7 to 12 percent slopes, severely eroded (214D3).—These soils are in waterways and in narrow irregular areas. The areas generally are between gently sloping, less eroded Hosmer soils and more strongly sloping Hosmer soils or nearly level, somewhat poorly drained Wakeland silt loam. Some narrow areas are between less sloping Hosmer soils and strongly sloping Zanesville soils that are less than 40 inches thick over sandstone.

Most of the original surface layer of these soils has been eroded away. The present surface layer is yellowish-brown to strong-brown silt loam to heavy silt loam that is less than 3 inches thick. It contains more clay than that in the profile described for the series, and preparing a seedbed therefore is more difficult. The content of organic matter is lower, tilth is poorer, erosion is a greater hazard, and less water moves into the soil and is held available for crops. Depth to the fragipan is about 14 inches; thus the rooting zone is severely limited.

Included with these soils are small areas of other Hosmer soils and of Zanesville soils that are less than 40 inches to sandstone. Also included are small areas of soils that are deeply gullied or that lack a fragipan.

The main limitations of these Hosmer soils are severe hazard of further erosion, slow movement of water in the fragipan, limited rooting depth, and low available water-holding capacity. The irregular slopes make it difficult to farm on the contour, install terraces and diversions, or apply other practices for control of erosion. Even if good management is used, the soils are only poorly suited to the common grain crops and are moderately well suited to hay and pasture. Good management consists of adding lime and fertilizer, growing grasses and legumes in the cropping system most of the time, returning all crop residues to the soils, and keeping tillage to a minimum. These practices help to control erosion, reduce water loss, and improve tilth. Grass waterways are difficult to install in some places because sandstone bedrock is exposed in some waterways. Management group IVe–4; woodland suitability group 4.

Hosmer silt loam, 12 to 18 percent slopes, eroded (214E2).—This soil is on narrow ridgetops and on narrow, irregular slopes. It is below gently sloping to moderately sloping Hosmer soils and above Wellston-Berks complex, 12 to 60 percent slopes, eroded. The areas also are above Wellston soils, which have no fragipan, and Zanesville soils, which have a fragipan. Both the Wellston and Zanesville soils are less than 40 inches deep to sandstone material.

The surface layer of this soil is yellowish brown to strong brown and is less than 10 inches thick. The fragipan, which is about 30 inches thick, is not so thick as in less sloping Hosmer soils.

Included with this soil are small areas of other Hosmer soils. Also included are small areas of Zanesville soils, which have a fragipan, and small areas of Wellston soils that do not have a fragipan.

Strong slopes, slow movement of water in the fragipan, low available water-holding capacity, and severe hazard of further erosion are the main limitations of this soil. This soil is not suited to row crops, and trees are growing on much of the acreage. Even if good management is used, the soil is only poorly suited to grain crops and only moderately well suited to hay and pasture. The strong and irregular slopes make it difficult to farm on the contour, install terraces and diversions, and apply other practices for the control of erosion. Grain can be grown if lime and fertilizer are applied, if grasses and legumes are grown in the cropping system most of the time, and if all crop residues are returned to the soil and tillage is kept to a minimum. These practices help to control erosion and reduce loss of water. Management group IVe–4; woodland suitability group 4.

Hosmer soils, 12 to 18 percent slopes, severely eroded (214E3).—These soils occupy narrow, irregular areas. They are below gently sloping to moderately sloping Hosmer soils and above moderately steep Wellston-Berks complex, 12 to 60 percent slopes, eroded. They also are above Wellston soils, which have no fragipan, and Zanesville soils, which have a fragipan. Both the Wellston and Zanesville soils are less than 40 inches deep to sandstone material.

The surface layer is yellowish-brown to strong-brown silt loam to heavy silt loam that is less than 3 inches thick. The fragipan, which is about 30 inches thick, is not so thick as that in less sloping Hosmer soils.

Included with these soils are small areas of other Hosmer soils. Also included are some areas of Zanesville and Wellston soils that are less than 40 inches deep to sandstone. Other included areas have many deep gullies.

These soils are better suited to pasture or woods than to other uses. Most areas have been cleared and farmed but are now idle and have a cover of shrubs and scrub trees. Erosion can be controlled by applying lime and fertilizer and seeding the areas to pasture or replanting to desirable trees. Management group VIe–2; woodland suitability group 4.

Iva Series

Iva soils are deep, nearly level to very gently sloping, light colored, and somewhat poorly drained. These soils are in the uplands in the northeastern part of the county. They formed in silty windblown material, or loess, generally more than 6 feet thick. The original vegetation was a hardwood forest consisting of oak, gum, ash, and maple.

The plow layer generally is brown silt loam about 7 inches thick. It overlies mixed light brownish-gray, brown, and brownish-yellow silt loam that has platy structure. The subsoil, which is at a depth of about 12 inches, is mottled grayish-brown, brown, and yellowish-brown light silty clay loam that is heavier with depth. It generally is about 21 inches thick.

These soils have high available moisture holding capacity. Their permeability is moderately slow to moderate. They are strongly acid to very strongly acid, are low in available phosphorus, and are medium in available potassium.

Representative profile of Iva silt loam, 1 to 4 percent slopes (NE10, SE40, NE160, sec. 21, T. 7 S., R. 9 E.):

Ap—0 to 7 inches, brown (10YR 5/3) silt loam; weak, fine and medium, granular structure; friable; abundant roots; strongly acid; abrupt, smooth boundary.

A2—7 to 12 inches, mixed light brownish-gray (10YR 6/2), brown (10YR 5/3), and brownish-yellow (10YR 6/6) silt loam; weak to moderate, thin, platy structure that breaks to weak, fine and medium, granular; friable; common worm casts and wormholes; abundant roots; very strongly acid; clear, smooth boundary.

B1—12 to 16 inches, mixed grayish-brown (10YR 5/2), brown (10YR 5/3) and yellowish-brown (10YR 5/4) light silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, fine and medium, subangular blocky structure; friable to firm; thin, discontinuous, dark grayish-brown (10YR 4/2) clay coatings; a few small iron concretions; common roots; black (10YR 2/1) iron streaks or remnants of old root channels; very strongly acid; clear, smooth boundary.

B21t—16 to 22 inches, mixed grayish-brown (10YR 5/2), brown (10YR 5/3), and yellowish-brown (10YR 5/6) silty clay loam; weak to moderate, medium, prismatic structure that breaks to moderate, coarse, subangular blocky; firm; thick, continuous, brown (10YR 4/3 to 5/3) clay coatings; common small iron

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concretions; common roots; strongly acid; clear, smooth boundary.

B22t—22 to 28 inches, mixed brown (10YR 5/3) and yellowish-brown (10YR 5/6) silty clay loam; common fine, faint, grayish-brown (10YR 5/2) mottles; weak to moderate, fine, prismatic structure that breaks to moderate, medium and coarse, subangular blocky; firm; thick, nearly continuous, brown (10YR 5/3) clay coatings; common roots; common small iron concretions; medium acid; clear, smooth boundary.

B3—28 to 33 inches, mixed brown (10YR 5/3) and yellowish-brown (10YR 5/6 and 5/8) light silty clay loam; a few, fine, faint, gray (10YR 6/1) to light brownish-gray (10YR 6/2) mottles; weak to moderate, coarse, subangular blocky structure; firm to friable; patchy yellowish-brown (10YR 5/4) clay coatings; common roots; common small to medium iron concretions; medium acid; abrupt, smooth boundary.

C—33 to 50 inches, mixed brownish-yellow (10YR 6/8), pale-brown (10YR 6/3), and yellowish-brown (10YR 5/4) silt loam; grayish-brown (10YR 5/2) streaks; massive; friable; a few roots to a depth of 40 inches; medium, soft, black (10YR 2/1) iron concretions; neutral.

The surface layer ranges in thickness from 18 inches, in nearly level areas, to about 8 inches, in very gently sloping areas. Its color ranges from very dark grayish brown to yellowish brown. The thickness of the subsoil ranges from 21 to 36 inches, depending on the slope.

Iva soils are similar to the Alford soils but have poorer drainage. They also are similar to the Stoy soils, but unlike them, have no fragipan.

Iva silt loam, 1 to 4 percent slopes (454B).—This is the only Iva soil mapped in the county. It occupies fairly broad ridgetops and relatively long slopes. The areas are above gently sloping Alford soils.

In color the surface layer ranges from brown, where it is 14 inches thick, to yellowish brown, where it is only 8 to 10 inches thick. Where the surface layer is 8 to 10 inches thick, the content of organic matter is lower than in areas where it is more than 10 inches thick, and in these areas it crusts readily after a rainstorm.

Included with this soil are some small areas of very gently sloping to gently sloping Alford soils.

Slopes and moderately slow to moderate permeability are the main limitations of Iva silt loam, 1 to 4 percent slopes. In the nearly level areas, excess surface water may be a problem. Tile can be used to provide drainage, but good management is needed because the tile drains the soil slowly. If lime and fertilizer are applied and if management is otherwise good, this soil is moderately well suited to all crops grown in the county. Farming on the contour, terracing, and growing grasses and legumes in the cropping system are needed for controlling erosion. In addition, all crop residues must be returned to the soil and tillage must be kept to a minimum. Management group IIw–2; woodland suitability group 1.

Jules Series

In the Jules series are deep, level to very gently sloping, light-colored soils that are well drained. These soils are north of Shawneetown. They formed in thick, limy, silty material washed from the Shawneetown Hills. The original vegetation was a forest made up of various kinds of hardwoods. Jules soils typically are brown to dark-brown silt loam to a depth of 16 inches and overlie yellowish-brown to dark yellowish-brown silt loam.

These soils have high available moisture capacity and are moderately permeable. They are calcareous, are low in available phosphorus, and are about medium in available potassium.

Representative profile of Jules silt loam on a slope of about 1 percent (SW10, NE40, SW160, sec. 5, T. 9 S., R. 10 E.):

Ap—0 to 7 inches, brown to dark-brown (10YR 4/3) silt loam; weak, fine, crumb structure; friable; strongly effervescent; abrupt, smooth boundary.

C1—7 to 10 inches, brown to dark-brown (10YR 4/3) silt loam; some streaks of yellowish brown (10YR 5/4); weak, thick, platy structure; friable; strongly effervescent; clear, smooth boundary; this horizon is a weakly developed, somewhat compacted plowpan.

C2—10 to 14 inches, brown to dark-brown (10YR 4/3) silt loam; some streaks of yellowish brown (10YR 5/4); weak, fine, crumb structure; friable; strongly effervescent; abrupt, discontinuous, wavy boundary.

C3–14 to 16 inches, mixed brown to dark-brown (10YR 4/3) and yellowish-brown (10YR 5/6) silt loam; weak, fine, crumb structure; friable; violently effervescent; abrupt, wavy boundary.

C4—16 to 21 inches, dark-brown (10YR 3/3 to 4/3) silt loam; a few, fine, faint, yellowish-brown (10YR 5/6) splotches; weak, fine, crumb structure; friable; strongly effervescent; clear, smooth boundary.

C5—21 to 25 inches, mixed dark yellowish-brown (10YR 3/4) and yellowish-brown (10YR 5/4) silt loam; weak, fine, crumb structure; friable; strongly effervescent; clear, smooth boundary.

C6—25 to 45 inches +, dark yellowish-brown (10YR 3/4) silt loam; a few, fine, faint, yellowish-brown (10YR 5/4) mottles; weak, fine, crumb structure; friable; strongly effervescent.

In color the surface layer ranges from brown to dark brown. Throughout the profile, the soil material generally effervesces if dilute hydrochloric acid is applied. The thickness of the limy, silty material in which the soils formed ranges from 30 inches to several feet, but it is more than 40 inches in most places.

Jules silt loam (28).—This is the only Jules soil mapped in the county. It is nearly level to very gently sloping. The areas are adjacent to lower lying areas of Worthen silt loam, which is dark colored, and Wakeland silt loam, which is light colored and somewhat poorly drained. Jules silt loam is lighter in color where it is adjacent to the Wakeland soil, and is darker in color where it is adjacent to the Worthen soil.

Included with this soil are small areas of light-colored, well-drained Haymond soils and of light-colored, somewhat poorly drained Wakeland silt loam, neither of which is calcareous. Also included are some areas of a soil, just north of Shawneetown Hills, that has a sandy, calcareous surface layer.

If fertilizer is applied as needed, and if supplemental nitrogen is also used, Jules silt loam is well suited to all crops grown in the county and can be cultivated intensively. Because the content of lime is high in this soil, soluble phosphates, rather than rock phosphate, are needed for correcting phosphate deficiency. Management group I–2; not assigned to a woodland suitability group.

Karnak Series

Karnak soils are deep, nearly level, light colored, and very poorly drained. These soils are on broad, low bottoms along the Ohio and Saline Rivers. They formed in silty clay material 40 or more inches thick. The vegetation was a forest of pin oak, black oak, gum, and cypress.

In most places the surface layer is dark grayish-brown to very dark grayish-brown, sticky silty clay 5 to 8 inches thick. The subsoil is mottled light-gray to gray and grayish-brown silty clay that is 24 to 48 inches thick. It is moderately developed to weakly developed.

These soils have high available moisture holding capacity and are very slowly to slowly permeable. They are strongly acid to neutral, are low to medium in available phosphorus, and are medium in available potassium.

Representative profile of a Karnak silty clay on a slope of 0 to 2 percent (NE40, SW160, sec. 3, T. 9 S., R. 10 E.):

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) to very dark grayish-brown (10YR 3/2) silty clay; moderate, medium, subangular blocky structure; very firm; medium acid; abrupt, smooth boundary.

B1g—5 to 12 inches, mixed light-gray to gray (10YR 6/1) and grayish-brown (10YR 5/2) silty clay; a few, fine, distinct, brown to dark-brown (7.5YR 4/4) mottles; massive; very firm; medium acid; abrupt, smooth boundary.

B2g—12 to 24 inches, mixed light-gray to gray (10YR 6/1) and grayish-brown (10YR 5/2) silty clay; a few, fine, distinct, brown to dark-brown (7.5YR 4/4) mottles; weak, medium, prismatic structure that breaks to moderate, medium, subangular blocky; very firm; medium acid; diffuse, smooth boundary.

B3g—24 to 48 inches, mixed light-gray to gray (10YR 6/1) and grayish-brown (10YR 5/2) silty clay; a few, fine, distinct, brown to dark-brown (7.5YR 4/4) mottles; massive; very firm; medium acid; abrupt, smooth boundary.

C1—48 to 49 inches, mixed light-gray to gray (10YR 6/1) and grayish-brown (10YR 5/2) sandy clay; a few, fine, distinct, brown to dark-brown (7.5YR 4/4) mottles; massive; friable to firm; contains some sand and small pebbles; very weakly effervescent; abrupt, smooth boundary.

C2—49 to 80 inches +, mixed light-gray to gray (10YR 6/1) and grayish-brown (10YR 5/2) silty clay; a few, fine, distinct, brown to dark-brown (7.5YR 4/4) mottles; massive; very firm; neutral.

The texture of the uppermost 10 to 20 inches of the profile ranges from heavy silty clay loam to silty clay. The content of clay increases with depth. Structure ranges from very weak angular blocky to moderate subangular blocky. The soils are mildly alkaline to strongly acid.

Karnak soils are similar to Petrolia and Piopolis soils but are more clayey.

Karnak silty clay (426).—This soil has the profile described for the series. It is on broad nearly level areas and on gently sloping and sloping areas adjacent to sloughs. The areas are lower than Emma soils, which are on low terraces, and are only slightly lower than those occupied by the moderately dark colored Darwin soils. They are somewhat higher than areas of Wallkill silty clay loam, wet, which is shallow to peat or muck.

The surface layer ranges from silty clay to heavy silty clay loam in texture. Its color ranges from dark gray to very dark grayish brown.

Included with this soil are small areas of moderately dark colored Darwin soils and of Karnak silty clay, wet. Also included are some areas of light-colored, slightly acid Petrolia silty clay loam and of light-colored, strongly acid Piopolis silty clay loam.

Most of this Karnak soil has been cleared of trees within the last 10 years. Slow movement of water into and through the soil and frequent flooding (fig. 12) during winter and spring are the main limitations. If drained, and if lime and fertilizer are applied, this soil is well suited to corn, soybeans, and other summer crops. Surface drains can be used to provide drainage, but tile drains do not work well. Returning all crop residues to the soil, keeping tillage to a minimum, and other similar practices help to improve tilth and to increase permeability. Management group IIIw–4; woodland suitability group 11.

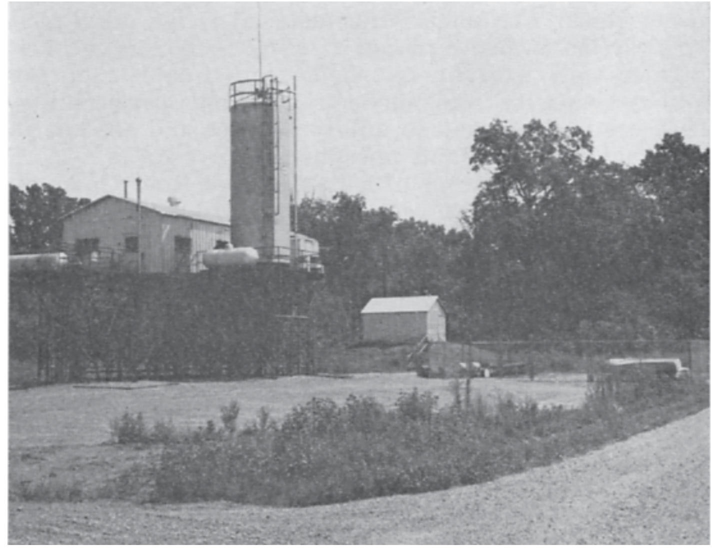

***Figure 12.*—Frequent flooding limits use of Karnak silty clay for crops and makes it necessary to place oilfield equipment on a platform.**

Karnak silty clay, wet (W426).—This soil is nearly level. It generally is in old abandoned channels of rivers and other streams. The areas are long and narrow and are depressional in places. They are in sloughs or other areas that are flooded frequently or have water on the surface most of the time.

Frequent flooding and a permanently high water table make this soil poorly suited to grain or hay. The soil is probably better suited to trees than to other uses. The harvesting of trees is risky, however, because water is on or at the surface of the soil for most of the year. Management group Vw–1; woodland suitability group 12.

Lamont Series

Lamont soils are deep, very gently sloping to moderately steep, light colored, and well drained. Some areas are on sandy terraces in the eastern part of the county or are on sandy knolls on broad terraces in the central part of the county. Other areas are in the uplands south of Shawneetown on moderately steep, west-facing slopes in the northwestern part of Bowlesville Township. Still other areas are south of Shawneetown on west- and north-facing slopes of Gold Hill. These soils formed in moderately coarse textured to coarse textured material under a forest consisting of various kinds of hardwoods.

The surface layer generally is brown fine sandy loam about 6 inches thick. Just below is dark yellowish-brown to strong-brown loamy fine sand. At a depth of about 21 inches is brown to dark-brown fine sandy loam about 15 inches thick. The underlying material is fine sand that is calcareous in many places.

These soils have low to moderate available moisture holding capacity and moderately rapid permeability. They are medium acid to mildly alkaline and are low in available potassium and phosphorus.

Representative profile of a Lamont fine sandy loam on a slope of about 5 percent (SW10, SW40, NW160, sec. 25, T. 8 S., R. 9 E.):

Ap—0 to 6 inches, brown (10YR 4/3 to 5/3) fine sandy loam; very weak, fine, granular structure; very friable; mildly alkaline; abrupt, smooth boundary.

A21—6 to 13 inches, dark yellowish-brown (10YR 4/4) loamy sand; single grain; loose; neutral; clear, smooth boundary.

A22—13 to 21 inches, strong-brown (7.5YR 5/6) loamy fine sand; single grain; loose; neutral; clear, smooth boundary.

B1—21 to 27 inches, brown to dark-brown (7.5YR 4/4) light fine sandy loam; weak, coarse, subangular blocky structure; friable; medium acid; clear, smooth boundary.

B2—27 to 36 inches, brown to dark-brown (7.5YR 4/4) fine sandy loam; common yellowish-brown (10YR 5/6) mottles; weak, coarse, subangular blocky structure; friable; medium acid; abrupt, smooth boundary.

C1—36 to 60 inches, dark yellowish-brown (10YR 4/4), loose, incoherent fine sand; medium acid; abrupt, smooth boundary.

C2—60 to 80 inches, pale-yellow (2.5Y 7/4) to light yellowish-brown (2.5Y 6/4) fine sand; single grain; loose; calcareous.

Color of the surface layer ranges from dark brown to brown. The subsoil ranges from sandy loam to loam or sandy clay loam, or heavier, in texture, and from less than 10 to 30 inches in thickness. The solum ranges from medium acid to neutral. In many places the material underlying the Lamont soils is calcareous at a depth of more than 60 inches.

Lamont soils are coarser textured than Alvin soils but are finer textured than Bloomfield soils. They are lighter colored than Onarga soils, which formed under prairie grasses.

Lamont fine sandy loam, 1 to 4 percent slopes (175B).—This soil is on sandy terraces in the eastern and central parts of the county. In some places it is on the tops of sandy knolls. In the other places it occupies elevated areas surrounded by somewhat poorly drained, sandy Roby soils and well-drained, silty Camden soils. The surface layer is somewhat thicker than that in the profile described for the series.

Included with this soil are some small areas of finer textured Alvin soils and of coarser textured Bloomfield soils.

The main limitations of this Lamont soil are low available water holding capacity, which makes the soil droughty, and hazard of wind erosion. Under good management this soil is suited to all cultivated crops commonly grown in the county and to watermelons and other special crops. It also is moderately well suited to the common grain crops and is well suited to hay and pasture. Good management consists of growing deep-rooted grasses and legumes in the cropping system for much of the time, returning all crop residues to the soil, keeping tillage to a minimum, and other similar practices. These practices improve the water-holding capacity of the soil. In addition lime and fertilizer are needed. The fertilizer should be applied annually, for water moves rapidly through the soil and causes excessive leaching. Management group IIIs–1; woodland suitability group 8.

Lamont fine sandy loam, 4 to 7 percent slopes (175C).—This soil has the profile described for the series. Some areas are on sandy terraces in the eastern part of the county and on sandy knolls in the central part. Other areas are on west-facing slopes in the northwestern part of Bowlesville Township, 3 miles south of Junction. Still other areas are on west- and north-facing slopes of Gold Hill and of Shawneetown Hills, which are south and north, respectively, of Shawneetown. The areas are surrounded by somewhat poorly drained, sandy Roby soils and well-drained, silty Camden soils or are surrounded by more sloping and less sloping Lamont soils.

Included with this soil are some small areas of finer textured Alvin soils and of coarser textured Bloomfield soils. Also included are some areas of moderately eroded Lamont soils.

The main limitations of this Lamont soil are slopes; hazard of wind and water erosion; and low available water holding capacity, which makes the soil droughty. Under good management this soil is suited to all cultivated crops commonly grown in the county and to watermelons and other special crops. It also is moderately well suited to the common grain crops and is well suited to hay and pasture. Good management consists of growing deep-rooted grasses and legumes in the cropping system much of the time, returning all crop residues to the soil, keeping tillage to a minimum, and growing cover crops. These practices reduce the hazard of erosion and improve the available water holding capacity. In addition lime and fertilizer are needed. The fertilizer should be applied annually, for water moves rapidly through the soil and causes excessive leaching. Management group IIIe–1; woodland suitability group 8.

Lamont fine sandy loam, 7 to 12 percent slopes, eroded (175D2).—This soil is on sandy terraces in the eastern part of the county and on side slopes of sandy knolls in the northwestern part. It also occupies west-facing slopes in the northwestern part of Bowlesville Township, 3 miles south of Junction. The areas generally are intermingled with strongly sloping to moderately steep Lamont soils. In some places, however, the areas are narrow and are below finer textured Alvin soils and above somewhat poorly drained Roby soils.

Much of the original surface layer of this soil has been lost through erosion. Dark yellowish-brown or strong-brown material formerly in the subsurface layer has been mixed with the remaining surface layer by plowing. As a result the present surface layer generally is yellowish brown. The subsoil is sandy loam, about 20 inches thick, in places and silty clay loam, about 8 inches thick, in other places.

Included with this soil are small areas of finer textured Alvin soils and of coarser textured Bloomfield soils. Also included are some areas, where the soils are severely eroded and the subsoil is exposed.

The main limitations of this Lamont soil are slopes; hazard of wind and water erosion; and low to very low available water holding capacity, which makes the soil droughty. This soil probably is better suited to small grains and to forage crops than to other uses. Growing deep-rooted grasses and legumes in the cropping system most of the time, returning all crop residues to the soil, keeping tillage to a minimum, and similar practices can be used to reduce erosion and improve the water-holding capacity. Lime and fertilizer also are needed. The fertilizer should be applied annually, for water moves rapidly through the soil and causes excessive leaching. Management group IIIe-1; woodland suitability group 8.

Marissa Series

In the Marissa series are deep, nearly level, moderately dark colored soils that are somewhat poorly drained to poorly drained. These soils are on broad, low terraces that have a slightly higher elevation than more swampy areas in the north-central part of the county. They formed under swamp grasses and trees in silty glacial sediment of Wisconsin age.

The surface layer typically is very dark gray to dark-gray silt loam about 12 inches thick. Just below is dark-gray to grayish-brown silt loam. At a depth of about 18 inches is grayish-brown silty clay loam about 25 inches thick. This layer has light olive-brown mottles.

These soils have high available moisture capacity and are moderately slowly permeable. They generally are neutral and are medium in available phosphorus and potassium.

Representative profile of Marissa silt loam on a slope of less than 1 percent, 150 feet west of the road at the entrance to a field (SE10, NE40, SE160, sec. 11, T. 8 S., R. 8 E.):

A1—0 to 12 inches, very dark gray (10YR 3/1) to dark-gray (10YR 4/1) silt loam; weak, fine, granular structure; friable; neutral; clear, smooth boundary.

A2—12 to 18 inches, dark-gray (10YR 4/1) to grayish-brown (10YR 5/2) silt loam; weak, medium, platy structure that breaks to weak, fine, granular; friable; neutral; clear, smooth boundary.

B1—18 to 22 inches, grayish-brown (10YR 5/2) silty clay loam; many yellowish-brown (10YR 5/4) mottles; weak, medium, subangular blocky structure that breaks to weak, medium, granular; friable to firm; neutral; clear, smooth boundary.

B2tg—22 to 35 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, fine, faint, light olive-brown (2.5Y 5/4) mottles; continuous dark-gray (10YR 4/1) clay coatings; weak to moderate, coarse, prismatic structure that breaks to strong, fine and medium, subangular blocky; firm; a few black (10YR 2/1) manganese concretions; neutral; clear, smooth boundary.

B3tg—35 to 43 inches, dark grayish-brown (2.5Y 4/2) to grayish-brown (2.5Y 5/2) silty clay loam; many, fine, faint, light olive-brown (2.5Y 5/4) mottles; dark-gray (10YR 4/1) clay coatings that become fainter with depth; medium, weak to moderate, subangular blocky structure; firm; many iron and manganese concretions; neutral; clear, smooth boundary.

C1—43 to 50 inches, light olive-brown (2.5Y 5/4) and light yellowish-brown (2.5Y 6/4) heavy silt loam; massive; friable; mildly alkaline; clear, smooth boundary.

C2—50 to 56 inches +, light yellowish-brown (2.5Y 6/3) silt loam; many yellowish-brown (10YR 5/8) mottles; massive; friable; calcareous.

In color the surface layer ranges from dark grayish brown to very dark gray. Depth to carbonates ranges from 40 to 60 inches. Drainage ranges from somewhat poor to poor, and permeability, from moderately slow to moderate.

Marissa soils are similar to Patton soils, but they have a silty surface layer rather than a clayey one. They have poorer drainage than Harco soils and also have a somewhat lighter colored surface layer.

Marissa silt loam (176).—This is the only Marissa soil mapped in the county. It is nearly level and is on broad terraces. The areas are somewhat higher than surrounding, broader and more extensive areas of Patton soils. They also are somewhat lower than the nearby light-colored Alvin, Camden, Reesville, Roby, and Starks soils.

Included with this soil are some areas that have deposits, consisting of 10 inches or more of grayish-brown silt loam overlying the original surface layer. Also included are small areas of Patton silty clay loam and of light-colored, silty Reesville soils.

Under good management Marissa silt loam is well suited to all crops commonly grown in the county, and most areas are farmed intensively. Good management consists of returning all crop residues to the soil, of keeping tillage to a minimum, and of other similar practices. Lime generally is not needed, but phosphorus and potassium should be applied as needed. In some places surface water is a slight problem. Tile can be used in these wet areas to provide drainage. Management group I-1; not assigned to a woodland suitability group.

Markland Series

Markland soils are deep, nearly level to strongly sloping, light colored, and moderately well drained to well drained. These soils are on low terraces adjacent to the Saline River and to Cypress Ditch. They formed in fine silt and clay laid down in water. The original vegetation was a forest consisting of various kinds of hardwoods.

In most places the surface layer is mixed pale-brown and brown silt loam that has granular structure. Just below is pale-brown to light yellowish-brown silt loam that has platy structure. The subsoil is at a depth of about 11 inches. It is yellowish-brown silty clay loam in the uppermost part and silty clay to clay below and has blocky structure. At a depth of less than 50 inches, calcium concretions are common.

These soils have moderate available moisture holding capacity and are slowly to very slowly permeable. The surface layer and the upper part of the subsoil are strongly acid to very strongly acid, are low in available phosphorus, and are medium in available potassium.

Representative profile of a Markland silt loam on a slope of about 3 percent, 200 feet south of the quarter section line and a farm lane (NE10, SE40, SE160, sec. 4, T. 8 S., R. 8 E.):

Ap—0 to 7 inches, mixed pale-brown (10YR 6/3) and brown (10YR 5/3) silt loam; very weak, coarse, granular structure; friable; medium acid; abrupt, smooth boundary.

A21—7 to 9 inches, pale-brown (10YR 6/3) silt loam; a few, fine, faint, very pale brown (10YR 7/3) and yellow (10YR 7/6) mottles; weak, thin, platy structure; friable; strongly acid; clear, smooth boundary.

A22—9 to 11 inches, light yellowish-brown (10YR 6/4) silt loam; a few, fine, faint, brownish-yellow (10 YR 6/6) mottles and common, medium, distinct, very pale brown (10YR 7/3) mottles; weak, medium and coarse, granular structure; friable; very strongly acid; clear, smooth boundary.

B1—11 to 16 inches, dark yellowish-brown (10YR 4/4), yellowish-brown (10YR 5/6), and pale-brown (10YR 6/3), finely mixed light silty clay loam; weak to moderate, medium, subangular blocky structure; friable to firm; thin pale-brown (10YR 6/3) silica coatings and a few yellowish-red (5YR 5/6) ped faces; very strongly acid; abrupt, smooth boundary.

B21t—16 to 23 inches, yellowish-brown (10YR 5/6) silty clay to clay; weak to moderate, coarse, prismatic structure that breaks to moderate, coarse, angular blocky; firm and sticky; thin, discontinuous, brown (7.5YR 4/4 and 5/4) clay coatings and light brownish-gray (10YR 6/2) silt pockets or root channels; very strongly acid; gradual, smooth boundary.

B22t—23 to 35 inches, yellowish-brown (10YR 5/4) silty clay to clay; weak, medium and coarse, prismatic structure that breaks to moderate, coarse, angular blocky; plastic and sticky; coarse, patchy, very dark brown (10YR 2/2) iron stains on ped faces and thin, patchy, dark-brown (10YR 4/3) clay coatings; very strongly acid; gradual, smooth boundary.

B23t—35 to 39 inches, mixed brown (10YR 5/3) and yellowish-brown (10YR 5/6) silty clay; a few, fine, faint, light brownish-gray (10YR 6/2) mottles; weak, coarse, prismatic structure that breaks to weak to moderate, medium, angular blocky; firm; plastic; neutral; abrupt, smooth boundary.

B3—39 to 43 inches, brown (10YR 5/3) silty clay; many, coarse, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; firm when moist, but slightly plastic when wet; a few, fine, faint, light brownish-gray (10YR 6/2) root channels; calcareous and has common, medium to coarse, calcium concretions; abrupt, smooth boundary.

C—43 to 48 inches, yellowish-brown (10YR 5/4) silty clay; a few, medium, faint, light brownish-gray (10YR 6/2) mottles and a few, fine, faint, strong-brown (7.5YR 5/6) mottles; massive; firm when moist, but slightly plastic when wet; contains a few, small, snail shells; calcareous; mildly effervescent.

The surface layer is up to 12 inches thick in uneroded areas and less than 1 inch thick in severely eroded areas. Its color ranges from dark grayish brown in nearly level, uneroded areas to yellowish-brown in eroded areas. The subsoil ranges from 24 to 45 inches in thickness.

Markland soils are similar to Camden soils, but unlike them, have a fine-textured subsoil and substratum. Camden soils have sandy material at a depth of less than 40 inches. Markland soils also are similar to McGary soils but are better drained.

Markland silt loam, 1 to 4 percent slopes (467B).—This soil has the profile described for the series. It is nearly level in places and occupies slightly elevated areas surrounded by dark-colored Montgomery soils. In other places the soil is very gently sloping and occupies long, narrow slope breaks between somewhat poorly drained McGary soils and poorly drained Karnak soils. In still other places, this soil is on long, narrow, irregular slopes around waterways that extend into areas of nearly level McGary soils.

Included with this soil are some small areas of very gently sloping McGary soils and of gently sloping Markland soils.

The main limitations of this Markland soil are moderate water-holding capacity, slow to very slow permeability, and slopes. The very gently sloping areas are subject to serious erosion. If tilth is improved, moisture-holding capacity is increased, and erosion is reduced, this soil is moderately well suited to well suited to the crops commonly grown. Practices needed are growing grasses and legumes in the cropping system, returning all crop residues to the soil, keeping tillage to a minimum, and applying lime and fertilizer. It is difficult to farm on the contour and install terraces and diversions because the areas are fairly long and narrow and are irregular in shape. Management group IIIe–4; woodland suitability group 7.

Markland silt loam, 2 to 4 percent slopes, eroded (467B2).—Some areas of this soil are on long, narrow slope breaks between somewhat poorly drained McGary soils and more strongly sloping Markland soils. Other areas are on narrow, irregular slopes in and around waterways that extend into areas of nearly level, somewhat poorly drained McGary soils.

All except 3 to 7 inches of the original surface layer of this soil has been removed through erosion, and clayey material formerly in the subsoil has been mixed with the remaining surface layer by plowing. The present surface layer therefore is pale brown to yellowish brown and is finer textured than that in the profile described for the series. It also is lower in content of organic matter and crusts readily after a rain. As a result, runoff and the hazard of erosion are greater and less water moves into the soil and is held available for crops.

Included with this soil are some small areas of very gently sloping and gently sloping Markland soils.

The main limitations of this Markland soil are slopes, moderate hazard of further erosion, moderate available water holding capacity, and slow to very slow permeability. Even if tilth is improved, water-holding capacity is increased, and erosion is controlled, this soil is only poorly suited to the crops commonly grown. Practices needed are growing grasses and legumes in the cropping system, returning all crop residues to the soil, keeping tillage to a minimum, and applying lime and fertilizer. It is difficult to farm on the contour and install terraces and diversions because the areas are fairly long and narrow and are irregular in shape. Management group IIIe–4; woodland suitability group 7.

Markland silt loam, 4 to 7 percent slopes, eroded (467C2).—This soil occupies long, narrow slope breaks in and around waterways. The areas extend into areas of nearly level to very gently sloping, somewhat poorly drained McGary soils.

All except 3 to 7 inches of the original surface layer of this soil has been removed through erosion, and clayey material formerly in the subsoil has been mixed with the remaining surface layer by plowing. The present surface layer therefore is yellowish brown and contains more clay than that in the profile described for the series. It also contains less organic matter and crusts readily after a rainstorm. Consequently, runoff and the hazard of erosion are greater and less water moves into the soil and is held available for crops.

Included with this soil are some small areas of very gently sloping and moderately sloping Markland soils.

The main limitations of this Markland soil are slopes, moderate hazard of further erosion, and slow to very slow permeability. Even if tilth is improved, water-holding capacity is increased, and erosion is controlled, this soil is only poorly suited to the crops commonly grown. Practices needed are growing grasses and legumes in the cropping system, returning all crop residues to the soil, keeping tillage to a minimum, and applying lime and fertilizer. The irregular shape of the areas makes it difficult to farm on the contour and to install terraces and diversions. Management group IIIe–4; woodland suitability group 7.

Markland soils, 4 to 7 percent slopes, severely eroded (467C3).—These soils occupy long, narrow slope breaks in and around waterways. The areas extend into areas of nearly level to very gently sloping, somewhat poorly drained McGary soils.

Most, and in many places all, of the original surface layer of these soils has been removed through erosion. Plowing has mixed material from the subsoil into the remaining surface layer. The present surface layer is dark yellowish-brown silt loam to silty clay. It is less than 3 inches thick or is lacking. It also contains more clay than the original one, and preparing a seedbed therefore is difficult. The subsoil is about 30 inches thick.

Included with these soils are small areas of less eroded, gently sloping Markland soils. Also included are some areas of strongly sloping Markland soils.

The main limitation of these Markland soils are slopes, severe hazard of further erosion, and slow to very slow permeability. Even if erosion is controlled, tilth improved, and permeability increased, the soils are poorly suited to row crops and are only moderately well suited to hay and pasture. Practices needed are growing grasses and legumes in the cropping system much of the time, returning all crop residues to the soils, and keeping tillage to a minimum. Lime and fertilizer also are needed. Management group IVe–3; woodland suitability group 7.

Markland silt loam, 7 to 12 percent slopes, eroded (467D2).—Some areas of this soil are on long, narrow slope breaks below nearly level, somewhat poorly drained McGary soils and above nearly level, poorly drained Karnak soils. Other areas occupy slopes in and around waterways that extend into areas of nearly level, somewhat poorly drained McGary soils.

Much of the original surface layer of this soil has been removed through erosion. The present surface layer is yellowish brown and is 3 to 7 inches thick. It has a lower content of organic matter than the original one and crusts readily after a rain. As a result, runoff and the hazard of further erosion are greater and less water moves into the soil and is held available for crops. The subsoil is about 28 inches thick.

Included with this soil are small areas of less sloping and more strongly sloping Markland soils. Also incuded are small areas of severely eroded soils that have less than 3 inches of their original surface layer remaining.

The main limitations of this Markland soil are slow to very slow permeability, slopes, and moderate hazard of further erosion. Grasses and legumes can be grown in the cropping system most of the time to control erosion, improve tilth, and increase permeability. Even under good management the soil is poorly suited to grain and is only moderately well suited to hay and pasture. Management group IVe–3; woodland suitability group 7.

Markland silt loam, 12 to 18 percent slopes (467E).—Some areas of this soil are on slope breaks below very gently sloping Markland soils and above nearly level, poorly drained Karnak soils. Other areas are on slopes and in and around waterways that extend into areas of nearly level, somewhat poorly drained McGary soils. The subsoil is about 26 inches thick.

Included with this soil are small areas of moderately sloping McGary soils and of other Markland soils. Also included are some areas of severely eroded Markland soils, shown on the detailed soil map by a spot symbol. These severely eroded soils have a high content of clay, and it is therefore difficult to prepare a seedbed in them.

Strong slopes, severe hazard of further erosion, and slow to very slow permeability are the main limitations of this Markland soil. The soil probably is better suited to pasture or trees than to other uses, and most areas are in trees. The areas can be kept under grasses and legumes or trees for control of erosion. Even if lime and fertilizer are applied, growth of pasture is poor to moderate, and in the severely eroded areas it is poor. Management group VIe–2; woodland suitability group 7.

McGary Series

In the McGary series are nearly level to sloping, light-colored soils that are somewhat poorly drained. These soils are on low terraces adjacent to the Saline River and Cypress Ditch. They formed in fine silt and clay laid down in water. The original vegetation was a forest consisting of post oak, blackjack oak, and hickory.

The surface layer typically is dark grayish-brown to dark-brown silt loam. It overlies a slowly permeable to very slowly permeable subsoil consisting of mottled grayish-brown, brownish-gray, and brown heavy silt loam to silty clay. Calcium concretions are common at a depth of less than 50 inches.

These soils have moderate available moisture capacity and are slowly to very slowly permeable. The surface layer and the upper part of the subsoil are strongly acid, but the subsoil becomes calcareous at a depth of less than 40 inches. Available phosphorus is low, and available potassium is medium to high.

Representative profile of McGary silt loam, 0 to 2 percent slopes, 10 feet south of a woods and 200 feet west of a lane (SW10, NE40, SE160, sec. 4, T. 8 S., R. 8 E.):

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

A2—5 to 11 inches, grayish-brown (10YR 5/2) silt loam; a few, fine, faint, yellowish-brown (10YR 5/4) mottles; weak, fine and medium, platy structure that breaks to weak, fine and medium, granular; friable; common roots; many small iron concretions; vesicular; strongly acid; clear, smooth boundary.

B1—11 to 16 inches, mixed grayish-brown (10YR 5/2), brown, (10YR 5/3) and yellowish-brown (10YR 5/4) heavy silt loam; dark yellowish-brown (10YR 3/4) streaks; weak, medium and coarse, subangular blocky structure; light brownish-gray (10YR 6/2) silt coats on peds; firm; vesicular; common roots; many small iron concretions; strongly acid; clear, smooth boundary.

B21t—16 to 25 inches, mixed light brownish-gray (10YR 6/2), grayish-brown (10YR 5/2), brown (10YR 5/3), and yellowish-brown (10YR 5/4) silty clay; a few, fine, distinct, brownish-yellow (10YR 6/8) mottles; weak to moderate, medium and coarse, subangular blocky structure; discontinuous dark grayish-brown (10YR 4/2) clay films on peds; very firm; a few black (10YR 2/1) streaks; common roots; neutral; clear, smooth boundary.

B22t—25 to 29 inches, mixed light brownish-gray (10YR 6/2), pale-brown (10YR 6/3), brown (10YR 5/3), and yellowish-brown (10YR 5/4 and 5/6) silty clay; moderate, coarse, angular blocky structure; continuous dark grayish-brown (10YR 4/2) clay films on peds; extremely firm; a few roots and iron concretions; black (10YR 2/1) splotches and streaks; neutral; gradual, smooth boundary.

B3—29 to 36 inches, mixed light brownish-gray (10YR 6/2), pale-brown (10YR 6/3), brown (10YR 5/3), and yellowish-brown (10YR 5/4 and 5/6) silty clay; weak, coarse, angular blocky structure; patchy dark grayish-brown (10YR 4/2) clay films; extremely firm; a few roots; mildly alkaline; clear, smooth boundary.

C1—36 to 46 inches, mixed gray (2.5Y 5/1) and light olive-brown (2.5Y 5/4 and 5/6) silty clay; weak, coarse, prismatic structure; firm; common black (10YR 2/1) iron stains and streaks; calcareous; abrupt, wavy boundary.

C2—46 to 57 inches, light brownish-gray (2.5Y 6/2) silty clay to clay; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; firm; many calcium concretions; strongly effervescent; abrupt, irregular boundary.

C3—57 to 60 inches; light brownish-gray (2.5Y 6/2) silty clay loam; coarse yellowish-brown (10YR 5/6) mottles; massive; firm; calcareous.

The surface layer ranges from 7 to 14 inches in thickness. It is yellowish brown in eroded areas and dark grayish brown in uneroded areas. The subsoil generally is 20 to 30 inches thick, but in some places the thickness is as much as 36 inches. Depth to calcareous material ranges from 10 inches in sloping, eroded areas to 40 inches in uneroded areas. Calcium concretions generally are at a depth of less than 50 inches.

McGary soils are similar to Weinbach soils but have a thinner surface layer and a finer textured subsoil. They also are similar to the poorly drained Okaw soils, but unlike them, are calcareous at a depth of less than 40 inches and are somewhat better drained.

McGary silt loam, 0 to 2 percent slopes (173A).—This soil has the profile described for the series. It is on low terraces between moderately dark colored, fine-textured, nearly level Montgomery soils and light-colored, sloping, silty Markland soils. The content of organic matter is low, and the surface layer crusts readily.

Included with this soil are small areas of poorly drained Okaw soils and of nearly level, moderately well drained Markland soils.

Slow to very slow permeability is the main limitation of this McGary soil. This soil also is slow to dry in spring. Drainage is needed if grain crops are grown. Tile drains do not work well, but surface drains can be used to remove excess water if the system is designed properly. Under good management, which includes adding lime and fertilizer and supplemental nitrogen as needed, the soil is moderately well suited to the common grain crops and well suited to hay and pasture. In addition grasses and legumes should be grown in the cropping system. Returning all crop residues to the soil, keeping tillage to a minimum, and providing drainage are ways of improving tilth, of increasing permeability, and of helping to dispose of excess water. Management group IIIw-3; woodland suitability group 7.

McGary silt loam, 2 to 4 percent slopes (173B).—This soil occupies slope breaks below nearly level McGary soils and above moderately dark colored, fine-textured, poorly drained Montgomery soils. The areas are narrow and long.

The surface layer is somewhat browner than that in the profile described for the series. It ranges from 7 to 10 inches in thickness. The content of organic matter is low, and the surface layer crusts readily.

Included with this soil are small areas of light-colored, silty Markland soils that are moderately well drained. Also included are some areas of moderately eroded McGary soils.

The main limitations of this McGary soil are slow to very slow permeability and hazard of erosion when cultivated. The soil also remains wet and cool until late in spring. If lime and fertilizer are applied, and later if supplemental nitrogen is added as needed, this soil is moderately well suited to the common crops and is well suited to hay and pasture. Growing grasses and legumes in the cropping system for a long time, returning all crop residues to the soil, keeping tillage to a minimum, and using other similar practices are ways of controlling erosion, improving tilth, and increasing permeability. Because the areas are long and narrow, installing some conservation measures is difficult. Management group IIIw-3; woodland suitability group 7.

McGary silt loam, 2 to 4 percent slopes, eroded (173B2).—This soil is on slope breaks below nearly level McGary soils and above moderately dark colored, fine-textured Montgomery soils that are poorly drained. The areas are long and narrow.

All except 3 to 7 inches of the original surface layer has been removed through erosion, and plowing has mixed clayey material formerly in the subsoil with the remaining surface layer. The present surface layer therefore is grayish brown to yellowish brown and is somewhat finer textured than that in the profile described for the series. Its content of organic matter also is low, and it crusts readily.

The main limitations of this soil are slow to very slow permeability and moderate erosion hazard when cultivated. The soil also remains wet and cold late in spring. Much of the acreage has been cultivated at some time. Because of low fertility, however, many of the areas have been left idle and have a cover of shrubs and scrub trees. Even if lime and fertilizer are applied, the soil is only poorly suited to moderately well suited to the common grain crops and is fairly well suited to hay and pasture. Growing grasses and legumes in the cropping system most of the time, returning all crop residues to the soil, keeping tillage to a minimum, and using other similar practices are ways of controlling erosion, improving tilth, and increasing water-holding capacity. It is difficult to farm on the contour, install terraces, and apply similar practices for the control of erosion because the areas are irregular in shape and are long and narrow. Management group IIIw-3; woodland suitability group 7.

McGary silt loam, 4 to 7 percent slopes, eroded (173C2).—This soil is on slope breaks below nearly level McGary soils and above moderately dark colored, fine-textured, poorly drained Montgomery soils, on terraces. It also is above areas of somewhat poorly drained Wakeland silt loam, which is on bottom lands. All of the areas are long and narrow and are irregular in shape.

All except 3 to 7 inches of the original surface layer has been eroded away. Plowing has mixed clayey material formerly in the subsoil with the remaining surface layer. As a result, the present surface layer is grayish brown to yellowish brown and is somewhat finer textured than that in the profile described for the series. It also is low in fertility and crusts readily. In addition runoff and hazard of erosion are greater, and less water moves into the soil and is held available for crops. The subsoil ranges from 20 to 26 inches in thickness. Depth to calcareous concretions is about 24 inches.

Included with this soil are small areas of less eroded, very gently sloping McGary soils. Also included are some small areas of severely eroded McGary soils.

The main limitations of this soil are slope, slow to very slow permeability, and moderate erosion hazard. The soil also remains wet and cool until late in spring. Thus spring planting is delayed. Much of the acreage has been cultivated at some time. Because of low fertility and erosion, however, many of the areas have been left idle and now have a cover of shrubs and scrub trees.

This soil probably is better suited to hay, pasture, or trees than to other uses. Even if lime and fertilizer are applied, the soil is only poorly suited to the common grain crops. If this soil is cultivated, practices are needed to reduce losses of soil and water and to improve tilth. Growing grasses and legumes in the cropping system for a long time, returning all crop residues to the soil, keeping tillage to a minimum, and similar practices can be used. Management group IIIe-6; woodland suitability group 7.

Montgomery Series

Montgomery soils are deep, nearly level, dark colored, and poorly drained. These soils are on broad terraces in the south-central part of the county. They formed in silty clay material of Wisconsin age. The vegetation was swamp grass and a mixed stand of sweetgum, ash, wild cherry, pecan, and water oak.

In most places the surface layer is very dark gray coarse silty clay about 13 inches thick. It overlies mottled, dark-gray to very dark gray silty clay that has blocky structure.

These soils have high available moisture holding capacity and are slowly permeable. They are slightly acid to neutral, are low in available phosphorus, and are medium to high in available potassium.

Representative profile of a Montgomery coarse silty clay (NE1, NE10, SW40, NE160, sec. 30, T. 9 S., R. 8 E.):

Ap—0 to 6 inches, very dark gray (10YR 3/1) coarse silty clay; moderate to strong, medium, subangular blocky structure; friable; neutral; abrupt, smooth boundary.

A1—6 to 13 inches, very dark gray (10YR 3/1) coarse silty clay; a few, coarse, faint, dark-gray (10YR 4/1) mottles; strong, coarse, subangular blocky structure that breaks to strong, fine, subangular blocky; friable; earthworms present; neutral; clear, smooth boundary.

B1g—13 to 16 inches, dark-gray (10YR 4/1) to very dark gray (10YR 3/1) silty clay; common, medium, distinct, yellowish-brown (10YR 5/4) and light yellowish-brown (2.5Y 6/4) mottles; weak to moderate, medium, subangular blocky structure; friable to firm; earthworms, clay films, and iron concretions present; neutral; clear, smooth boundary.

B21g—16 to 25 inches, dark-gray (10YR 4/1) to very dark gray (10YR 3/1) silty clay; common, medium, distinct, yellowish-brown (10YR 5/4) and light yellowish-brown (2.5Y 6/4) mottles; strong, medium to fine, subangular blocky structure; neutral; clay films and iron concretions present; gradual, smooth boundary.

B22g—25 to 32 inches, dark-gray (10YR 4/1) to very dark gray (10YR 3/1) silty clay; common, fine, distinct, light olive-brown (2.5Y 5/6) mottles and common, medium, distinct, light-olive (5Y 5/3) mottles; dark-gray (N 4/0) to very dark gray (N 3/0) clay films; moderate, medium, blocky structure; firm; neutral; clear, smooth boundary.

B31g—32 to 44 inches, dark grayish-brown (2.5Y 4/2) silty clay; common, fine, distinct, light olive-brown (2.5Y 5/6) mottles and common, medium, distinct, light olive-brown (2.5Y 5/4) mottles; weak, medium, blocky structure; firm; clay films present; neutral; abrupt, smooth boundary.

B32cag—44 to 50 inches, dark grayish-brown (2.5Y 4/2) silty clay; many, medium, distinct, yellowish-brown (10YR 5/8) and olive (5Y 4/3 to 5/3) mottles; dark-gray (N 4/0) to very dark gray (N 3/0) clay films; moderate to strong, medium to coarse, blocky structure; violently effervescent; calcium concretions and roots present; firm; clear, smooth boundary.

C1g—50 to 75 inches, greenish-gray (5GY 6/1) to light greenish-gray (5GY 7/1) silty clay; many, medium, distinct, yellowish-brown (10YR 5/8) mottles; moderate, medium to fine, blocky structure; firm; calcareous; iron concretions present; clear, smooth boundary.

IIC2—75 to 80 inches +, calcareous silt loam.

The surface layer ranges from 10 to 14 inches in thickness. Calcareous material is at a depth of less than 50 inches, and calcium concretions are common.

Montgomery soils are similar to Patton and Shiloh soils, but they contain more clay than Patton soils and have a thinner, somewhat lighter colored surface layer than Shiloh soils.

Montgomery silty clay (465).—This soil has the profile described for the series. It is nearly level and is on broad terraces in somewhat lower areas than those occupied by coarser textured, dark-colored Patton soils and light-colored McGary soils. The content of clay is high in this soil. Consequently, if the soil is farmed when wet, the surface layer becomes cloddy and dense and a compact plowpan forms.

Included with this soil are some small areas of coarser textured Patton soils and of darker colored Shiloh soils.

Most areas of this Montgomery soil are farmed intensively. Wetness is a slight limitation. Tile drains can be used to provide drainage if management is otherwise good, but they drain the soil slowly. Under good management this soil is moderately well suited to all crops commonly grown in the county. Good management consists of returning all crop residues to the soil, keeping tillage to a minimum, and using other similar practices. In addition, phosphorus and potassium are needed. The content of lime in the soil is high. Lime therefore generally is not needed, and use of rock phosphate generally is not suitable. Management group IIw-7; not assigned to a woodland suitability group.

Montgomery silt loam, overwash (465+).—This soil is nearly level and is on broad terraces near light-colored Alford and Hosmer soils, which are in the uplands. They also are near higher lying, light-colored, silty Reesville and Uniontown soils, which are on terraces.

The surface layer of this soil is dark grayish brown to very dark grayish brown. It consists of silty sediment washed from higher lying soils and is strongly acid to neutral. The overwash ranges from 15 to 30 inches in thickness. Preparing a seedbed in this soil is easier than in Montgomery silty clay, because this soil has a more silty surface layer.

Included with this soil are small areas of nearly level, somewhat poorly drained Reesville soils and of Patton silty clay loam. Also included are some areas of soils on which sediment has been deposited that is dark colored and silty or that is light colored and sandy.

Most areas of this Montgomery soil are farmed intensively. Wetness is a slight limitation. Tile drains can be used to provide drainage if management otherwise is good, but they drain the soil slowly. Under good management this soil is moderately well suited to all crops commonly grown in the county. Good management consists of returning all crop residues to the soil, keeping tillage to a minimum, and using other similar practices. The need for lime varies, depending on the source of the overwash. Phosphorus and potassium can be applied as needed. Management group IIw-7; not assigned to a woodland suitability group.

Okaw Series

In the Okaw series are nearly level, light-colored soils that are poorly drained. These soils are in nearly level to depressional areas in the south-central part of the county, on low terraces near the Saline River. They formed under a mixed stand of post oak and blackjack oak in waterlaid fine silt and clay.

The surface layer typically is dark grayish-brown silt loam about 6 inches thick. It overlies gray, granular silt loam that is about 3 inches thick. The subsoil is extremely firm, mottled, gray silty clay and is at a depth of about 9 inches. It is about 39 inches thick.

These soils have moderate available moisture holding capacity and are very slowly permeable. The surface layer and the upper part of the subsoil are very strongly acid, but the soil material becomes less acid with depth. The soils are low in available phosphorus and are low to medium in available potassium.

Representative profile of Okaw silt loam on a slope of less than 1 percent, 200 feet south of north section line and 660 feet east of half section line (NW40, NE160, sec. 36, T. 9 S., R. 8 E.):

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; a few, fine, faint, grayish-brown (10YR 5/2) mottles and many, medium, faint, brown (10YR 4/3) mottles; weak, fine, granular structure; friable; a few black (10YR 2/1) iron concretions; abundant roots; very strongly acid; abrupt, smooth boundary.

A2—6 to 9 inches, gray (10YR 6/1) silt loam; many, fine, faint, light-gray (10YR 7/1) mottles; many, medium, faint, light brownish-gray (2.5Y 6/2) mottles; a few, medium, prominent, dark-brown (7.5YR 4/4) mottles; and a few, medium, distinct, brownish-yellow (10YR 6/6) mottles; weak, fine and medium, granular structure; friable; vesicular; many iron concretions; common roots; very strongly acid; abrupt, smooth boundary.

B21tg—9 to 22 inches, gray (10YR 6/1) silty clay; many, coarse, prominent, yellowish-brown (10YR 5/6) mottles; weak, medium to coarse, prismatic structure that breaks to weak, fine to medium, angular blocky; extremely firm; continuous light brownish-gray (2.5Y 6/2) coatings; iron concretions; a few roots, mostly along cleavage planes; very strongly acid; gradual, smooth boundary.

B22tg—22 to 40 inches, gray (N 5/0) silty clay to clay; a few, fine, faint, grayish-brown (2.5Y 5/2) mottles and many, medium, distinct, yellowish-brown (10YR 5/4) mottles; weak, coarse, prismatic structure; extremely firm; discontinuous light brownish-gray (2.5Y 6/2) coatings; iron concretions; a few roots; very strongly acid; diffuse, smooth boundary.

B3g—40 to 48 inches, light olive-brown (2.5Y 5/3) to brown (10YR 5/3) silty clay to clay; many, fine, faint, gray (N 5/0) mottles and a few, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, coarse, prismatic structure; extremely firm; common, medium, distinct, very dark brown (10YR 2/2) iron concretions; medium acid; gradual, smooth boundary.

C1g—48 to 55 inches, light olive-brown (2.5Y 5/3) to brown (10YR 5/3) silty clay; many, fine, faint, gray (N 5/0) mottles and a few, fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; extremely firm; a few iron concretions; mildly alkaline; gradual, smooth boundary.

C2g—55 to 71 inches, light olive-brown (2.5Y 5/3) to brown (10YR 5/3) silty clay loam to silty clay; many, fine, faint, gray (N 5/0) mottles and a few, fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; very firm; moderately alkaline; (noncalcareous); gradual, smooth boundary.

C3g—71 to 80 inches, light olive-brown (2.5Y 5/3) to brown (10YR 5/3) silty clay loam to silty clay; many, fine, faint, gray (N 5/0) mottles and a few, fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; very firm; calcareous; contains concentration of calcium concretions in a layer 1½ inches thick.

The surface layer ranges from 6 to 12 inches in thickness, and the subsoil, from 36 to 48 inches. Gray silt fills channels to a depth of about 35 inches. Below a depth of 36 inches the soil material gradually becomes less acid, and at a depth of about 70 inches it becomes calcareous.

Okaw soils are similar to the McGary soils but have poorer drainage. They also are similar to the Sexton soils but formed in finer textured material.

Okaw silt loam (84).—This is the only Okaw soil mapped in the county. It is nearly level and is on low terraces along the Saline River. The areas generally are in closed depressions surrounded by nearly level McGary soils.

Included with this soil are some small areas of nearly level, somewhat poorly drained McGary soils.

Use of Okaw silt loam is moderately restricted because of very slow permeability. The soil dries out slowly in spring, and water stands in ponds on the areas until late in spring. Drainage is needed if grain is grown. Surface drains can be used to remove excess water, but tile drains do not work well. Under good management this soil is moderately well suited to the crops commonly grown. Good management consists of adding lime and fertilizer, returning all crop residues to the soil, keeping tillage to a minimum, and applying other similar practices. Management group IIIw-3; woodland suitability group 3.

Onarga Series

Soils of the Onarga series are nearly level to gently sloping, dark colored, and moderately well drained to well drained. They are moderately deep over fine sand. These soils are on terraces in the northeastern part of the county. They formed under grass in sandy material.

In most places the surface layer is very dark grayish-brown to very dark gray fine sandy loam about 12 inches thick. It overlies dark-brown to very dark grayish-brown heavy fine sandy loam about 6 inches thick. The upper part of the subsoil is dark yellowish-brown heavy sandy clay loam that is about 8 inches thick and has blocky structure. The lower part of the subsoil is dark yellowish-brown heavy sandy loam about 6 inches thick. At a depth below 30 inches or more is loose fine sand.

These soils have moderate available moisture holding capacity and are moderately rapidly permeable. They are strongly acid to slightly acid, but the material at a depth of 30 inches or more is neutral in reaction. Available phosphorus is low, and available potassium is low to medium.

Representative profile of an Onarga fine sandy loam on a slope of 2 to 4 percent (NW10, SE40, SW160, sec. 1, T. 8 S., R. 9 E.):

A1—0 to 12 inches, very dark grayish-brown (10YR 3/2) to very dark gray (10YR 3/1) fine sandy loam; weak, fine and medium, crumb structure; very friable; slightly acid; clear, smooth boundary.

A3—12 to 18 inches, dark-brown (10YR 3/3) to very dark grayish-brown (10YR 3/2) heavy fine sandy loam; weak, medium, granular structure; friable; slightly acid, clear, smooth boundary.

B21t—18 to 26 inches, dark yellowish-brown (10YR 3/4) heavy sandy clay loam; weak, medium, subangular blocky structure; friable to firm; slightly acid; clear, smooth boundary.

B22t—26 to 32 inches, dark yellowish-brown (10YR 3/4 to 4/4) heavy sandy loam; weak to moderate, medium, subangular blocky structure; firm; slightly acid; abrupt, smooth boundary.

C1—32 to 60 inches, dark-brown to brown (7.5YR 4/4) fine sand; single grain; loose; neutral; abrupt, smooth boundary.

C2—60 to 80 inches, light-brown (7.5YR 6/4) sand; single grain; loose; neutral.

In color the surface layer ranges from very dark gray to very dark brown. The texture and thickness of the subsoil ranges from sandy clay loam to sandy loam and from more than 10 inches in thickness to more than 30 inches in thickness.

Onarga soils are similar to Alvin soils, but unlike them, are dark colored. They have a somewhat coarser textured surface layer than Plano soils and contain more sand throughout the profile.

Onarga fine sandy loam, 1 to 4 percent slopes (190B).—This soil has the profile described for the series. It is on terraces in the east-central part of the county. Some of the areas are on slope breaks below more nearly level Onarga soils and above light-colored, silty Weinbach soils. Other areas are on ridgetops surrounded by Onarga fine sandy loam, 4 to 10 percent slopes.

Included with this soil are small areas of silty Plano soils. Also included are some soils that have a subsoil that is coarser textured than that in the profile described for the series or that is thinner.

The main limitations of this Onarga soil are slopes and moderate available moisture holding capacity. The soil also is slightly droughty. It is easy to till. Under good management the soil is moderately well suited to all of the common crops and to watermelons and to other special crops. It also is very well suited to grasses and legumes. Good management consists of growing deep-rooted grasses and legumes in the cropping system, adding lime and fertilizer as needed, turning all crop residues under, and applying other similar measures. Management group IIe-4; not assigned to a woodland suitability group.

Onarga fine sandy loam, 4 to 10 percent slopes (190C).—This soil is on terraces on slope breaks below Onarga fine sandy loam, 1 to 4 percent slopes, and above nearly level, dark-colored, silty Harco and Plano soils.

The surface layer is very dark grayish brown and is less than 14 inches thick. The subsoil is not so thick as that in the profile described for the series. It is about 18 inches thick.

Included with this soil are small areas of Onarga fine sandy loam, 1 to 4 percent slopes. Also included are some soils that have a subsoil that is coarser textured than that in the profile described for the series or that is thinner.

The main limitations of this Onarga soil are serious hazard of erosion and moderate available moisture holding capacity. If erosion is controlled and if the moisture-holding capacity is increased, this soil is well suited to the crops commonly grown and to watermelons and other special crops. It also is very well suited to grasses and legumes. Practices needed are adding lime and fertilizer as needed, growing deep-rooted grasses and legumes in the cropping system for a long time, returning all crop residues to the soil, and other similar measures. Management group IIIe-2; not assigned to a woodland suitability group.

Patton Series

In the Patton series are deep, nearly level, dark-colored soils that are poorly drained. These soils are on broad terraces in the north-central part of the county. They formed in silty clay loam material of Wisconsin age. The vegetation consisted of swamp grass and of sweetgum, ash, wild cherry, pecan, and water oak in a mixed stand.

Typically the surface layer is very dark gray to very dark grayish-brown silty clay loam about 16 inches thick. At a depth of about 16 inches is mottled, dark-gray silty clay loam that becomes olive with depth and has blocky structure.

These soils have very high available moisture holding capacity and are moderately permeable to moderately slowly permeable. They are neutral to moderately alkaline. Limy (calcareous) material generally is at a depth of less than 50 inches. The soils are high in lime, are low in available phosphorus, and are medium to high in available potassium.

Representative profile of Patton silty clay loam on a slope of less than 1 percent, 50 feet north of a road and 250 feet east of a drainage ditch (SW10, SE40, NW160, sec. 1, T. 8 S., R. 8 E.):

Ap—0 to 9 inches, very dark gray (10YR 3/1) to very dark grayish-brown (10YR 3/2) silty clay loam; weak, fine, crumb structure; firm; mildly alkaline to moderately alkaline; abrupt, smooth boundary.

A1—9 to 16 inches, very dark gray (10YR 3/1) silty clay loam; weak to moderate, fine to medium, crumb structure; firm; many roots; mildly alkaline; clear, smooth boundary.

B1g—16 to 21 inches, dark-gray (5Y 4/1) silty clay loam; a few, fine, faint, olive (5Y 5/3 and 4/4) mottles; weak, fine, subangular blocky structure; thin, continuous, very dark gray (10YR 3/1) coatings; firm; many roots; neutral; clear, smooth boundary.

B21g—21 to 30 inches, olive (5Y 5/4) silty clay loam; many fine, faint, dark-gray (5Y 4/1) mottles and a few, faint, olive (5Y 5/3) mottles; weak, medium, prismatic structure that breaks to moderate, medium, subangular blocky; continuous dark-gray (10YR 4/1) clay films; firm; mildly alkaline; gradual, smooth boundary.

B22g—30 to 37 inches, olive (5Y 5/4) silty clay loam; a few, fine, faint, olive (5Y 5/3 and 5/6) mottles; weak, medium, prismatic structure that breaks to weak to moderate, medium, subangular blocky; continuous dark-gray (10YR 4/1) clay films; firm; moderately alkaline; gradual, smooth boundary.

B3g—37 to 48 inches, olive (5Y 5/4) silty clay loam; many, medium, faint, olive (5Y 5/6) mottles and a few, fine, faint, olive (5Y 5/3) mottles; weak, coarse, subangular blocky structure; discontinuous dark-gray (10YR 4/1) clay films; firm; moderately alkaline; gradual, smooth boundary.

C—48 to 54 inches +, olive (5Y 5/6) silt loam; many, medium, faint, olive (5Y 5/4) mottles and a few, fine, faint, olive (5Y 5/3) mottles; massive; friable; black (10YR 2/1) krotovinas 3 to 4 inches in diameter; calcareous; gradual, smooth boundary.

The surface layer ranges from 10 to 16 inches in thickness and from very dark grayish brown to black in color. In reaction the solum ranges from slightly acid to moderately alkaline. Depth to calcareous material ranges from 30 to 60 inches.

Patton soils are similar to Montgomery soils but have less clay in all layers.

Patton silty clay loam (142).—This is the only Patton soil mapped in the county. It is nearly level and is on broad terraces.

The surface layer is very dark grayish brown to black. In places silty sediment washed from higher lying soils has been deposited on the original dark-colored surface layer. These areas are narrow and are adjacent to higher lying, light-colored Reesville soils or are intermingled between areas of higher lying, light-colored Reesville and Uniontown soils.

Included with this soil are some areas of Reesville soils. Also included are small areas of Marissa silt loam.

Most areas of Patton silty clay loam are farmed intensively (fig. 13). The main limitation is wetness, and tile can be used to provide drainage. Under good management the soil is well suited to all crops commonly grown in the county. Good management consists of returning all crop residues to the soil, keeping tillage to a minimum, and using other similar measures. Phosphorus and potassium can be applied as needed. Because of the high content of lime in the soil, however, lime generally is not needed and response to rock phosphate is low. Management group IIw-5; not assigned to a woodland suitability group.

Figure 13.—Intensive cropping on Patton silty clay loam.

Petrolia Series

Petrolia soils are deep, nearly level, light colored, and very poorly drained. These soils are on broad, low bottom lands along the Ohio and Saline Rivers. They formed in silty clay loam material more than 40 inches thick. The vegetation was a forest made up of cypress, soft maple, gum, and willow.

In most places the surface layer is dark gray to very dark gray in the upper part and mixed dark gray and dark grayish brown in the lower part. It consists of silty clay loam and is 8 to 12 inches thick. The subsoil is mottled dark-gray to gray silty clay loam that has blocky or prismatic structure.

These soils have high available moisture capacity and are moderately slowly permeable. They are medium acid to neutral, are low to medium in available phosphorus, and are medium to high in available potassium.

Representative profile of Petrolia silty clay loam on a slope of less than 1 percent, 2,080 feet north of a road on half section line (SE10, NE40, SW160, sec. 15, T. 9 S., R. 10 E.):

A1—0 to 3 inches, dark-gray (10YR 4/1) to very dark gray (10YR 3/1) silty clay loam; weak, fine, granular structure; friable to firm; slightly acid; clear, smooth boundary.

A2—3 to 12 inches, mixed dark-gray (10YR 4/1) and dark grayish-brown (2.5Y 4/2) silty clay loam; a few, fine, distinct, black (10YR 2/1) specks; weak, fine and medium, subangular blocky structure; firm; slightly acid; gradual, smooth boundary.

B1g—12 to 18 inches, dark-gray (10YR 4/1) silty clay loam; common, medium, faint, dark grayish-brown (2.5Y 4/2) mottles; weak, coarse, subangular blocky structure; firm; continuous dark-gray (10YR 4/1) coatings; a few, fine, distinct, black (10YR 2/1) iron concretions and specks; slightly acid; gradual, smooth boundary.

B21g—18 to 27 inches, gray (10YR 5/1) heavy silty clay loam; common, medium, distinct, dark-brown (7.5YR 4/4) mottles; weak, medium, prismatic structure that breaks to moderate, medium, subangular blocky; very firm; continuous gray (10YR 5/1) to dark-gray (10YR 4/1) coatings; a few, fine, distinct, black (10YR 2/1) iron concretions and specks; slightly acid; gradual, smooth boundary.

B22g—27 to 40 inches, gray (10YR 5/1) silty clay loam; common, coarse, distinct, dark-brown (7.5YR 4/4) mottles; weak to moderate, medium, prismatic structure that breaks to moderate, medium, angular blocky; very firm; continuous gray (10YR 5/1) and dark grayish-brown (2.5Y 4/2) coatings; a few, fine, distinct, black (10YR 2/1) iron concretions and specks; slightly acid; gradual, smooth boundary.

B3g—40 to 50 inches, gray (10YR 5/1) silty clay loam; common, coarse, distinct, dark yellowish-brown (10YR 4/4) mottles; weak, coarse, prismatic structure; firm; discontinuous gray (N 5/0) coatings; slightly acid; gradual, smooth boundary.

C—50 to 55 inches, gray (10YR 5/1) silty clay loam; common, coarse, distinct, dark yellowish-brown (10YR 4/4) to yellowish-brown (10YR 5/6) mottles; massive; firm; slightly acid.

The surface layer ranges from very dark gray to dark grayish brown in color and from 8 to 12 inches in thickness. The subsoil ranges from weak to moderate in structure. In places these soils grade toward Karnak soils in characteristics, and here the texture is heavy silty clay loam.

Petrolia soils are similar to Piopolis soils but are less acid. They have less clay in all layers than Karnak soils.

Petrolia silty clay loam (288).—This is the only Petrolia soil mapped in the county. It is nearly level and is on broad flats or is in depressions and sloughs. The areas are lower than those occupied by Allison silty clay loam, which is well drained, or by Tice silty clay loam, which is poorly drained.

Included with this soil are small areas of dark-colored Beaucoup silty clay loam and of more acid Piopolis silty clay loam. Also included are some areas of Karnak silty clays.

The main limitations of Petrolia silty clay loam are moderately slow permeability and flooding in winter and spring. Tile or surface drains can be used to remove excess water, and tile functions well under good management. If tilth is improved, permeability is increased, and drainage is provided, this soil is moderately well suited to corn and soybeans and to other summer crops. Such practices as returning all crop residues to the soil and keeping tillage to a minimum are needed. Lime and fertilizer also are needed. Management group IIw–6; woodland suitability group 11.

Piopolis Series

Soils in the Piopolis series are deep, nearly level, light colored, and very poorly drained. These soils are on broad, low bottom lands along the Ohio and Wabash Rivers. They formed in 40 or more inches of silty clay loam material. The vegetation was a mixed stand of pin oak, black oak, and gum trees.

The surface layer is generally very dark gray to dark-gray silty clay loam about 5 inches thick. It overlies mottled grayish-brown and gray to light-gray silty clay loam.

These soils have high available moisture holding capacity and are slowly permeable. They are strongly acid and are low in available phosphorus and potassium.

Representative profile of Piopolis silty clay loam on a slope of less than 1 percent (SW40, SW160, sec. 22, T. 8 S., R. 10 E.):

A—0 to 5 inches, very dark gray (10YR 3/1) to dark-gray (10YR 4/1) silty clay loam; moderate, medium to coarse, granular structure, firm; medium acid; abrupt, smooth boundary.

B1g—5 to 18 inches, grayish-brown (10YR 5/2) and gray to light-gray (10YR 6/1) silty clay loam; common, dark yellowish-brown to yellowish-brown (10YR 4/4 to 5/4) mottles; weak to moderate, medium to coarse, blocky to subangular blocky structure; firm; strongly acid; clear, smooth boundary.

B2g—18 to 40 inches, grayish-brown (10YR 5/2) to light brownish-gray (10YR 6/2) and gray to light-gray (10YR 6/1) silty clay loam; dark yellowish-brown to yellowish-brown (10YR 5/4 to 4/4) mottles; weak, coarse, subangular blocky structure; firm; strongly acid; clear, smooth boundary.

Cg—40 to 45 inches +, dark-gray (10YR 4/1) heavy silty clay loam; dark yellowish-brown (10YR 4/4) mottles; massive; firm; strongly acid.

The surface layer ranges from very dark gray to grayish brown in color and from 3 to 8 inches in thickness.

Piopolis soils are similar to Karnak soils but have less clay in all layers. They also are similar to Petrolia soils but are more acid.

Piopolis silty clay loam (420).—This is the only Piopolis soil mapped in the county. It is nearly level and is on broad flats or is in depressions and sloughs. The areas are somewhat higher than those occupied by Karnak soils.

Included with this soil are some areas of a soil that has grayish-brown silty sediment 10 to 20 inches thick on the original silty clay loam surface layer. Here the soil is easier to till than is Piopolis silty clay loam. Also included are small areas of Karnak soils and of Petrolia silty clay loam, which is medium acid to neutral. Other included areas are subject to ponding and are mostly in trees.

The main limitations of Piopolis silty clay loam are slow permeability and flooding in winter and in spring. Surface drains can be used to remove excess water, but tile drains do not work well. If tilth is improved, permeability is increased, and drainage is provided, this soil is suited to corn, soybeans, and other summer crops. It also is moderately well suited to well suited to the small grain crops commonly grown in the county. Such practices as returning all crop residues to the soil and keeping tillage to a minimum are needed. Lime and fertilizer also are needed. Management group IIIw-4; woodland suitability group 11.

Plano Series

In the Plano series are deep, nearly level to very gently sloping, moderately dark colored to dark colored soils that are moderately well drained to well drained. These soils are near sandy terraces in the northeastern part of the county in areas that range from 20 to 80 acres in size. They formed under grass in silty material more than 40 inches thick over stratified sandy and silty material.

The plow layer typically is very dark grayish-brown silt loam about 9 inches thick. Just below is very dark brown to very dark grayish-brown silt loam about 11 inches thick. The subsoil is dark-brown to brown silty clay loam about 36 inches thick. It is underlain by dark-brown sandy loam.

These soils have high available moisture holding capacity and are moderately permeable. They are medium acid to slightly acid and are medium in available phosphorus and potassium.

Representative profile of a Plano silt loam on a slope of less than 1 percent, 300 feet north of a road going from east to west and 105 feet west of the road (SE10, SW40, NW160, sec. 24, T. 8 S., R. 9 E.):

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine to medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A1—9 to 16 inches, very dark brown (10YR 2/2) to very dark grayish-brown (10YR 3/2) silt loam; strong, very fine to fine, subangular blocky structure and some weak, thin, platy structure; firm; slightly acid; clear, smooth boundary.

A3—16 to 20 inches, dark-brown (10YR 3/3 to 10YR 4/3) silt loam; yellowish-brown (10YR 5/6) specks and very dark brown (10YR 2/2) to very dark grayish-brown (10YR 3/2) organic coatings; moderate, very fine to fine, subangular blocky structure; friable; worm casts present; slightly acid; clear, smooth boundary.

B21t—20 to 31 inches, dark-brown to brown (10YR 4/3) silty clay loam; common, fine, faint, yellowish-brown (10YR 5/6) and pale-brown (10YR 6/3) mottles; dark-brown (10YR 3/3) clay coatings; strong, fine to medium, subangular blocky structure; very firm; mica flakes, worm casts, and iron concretions present; slightly acid; clear, smooth boundary.

B22t—31 to 40 inches, dark-brown to brown (10YR 4/3) coarse silty clay loam; common, fine, faint, yellowish-brown (10YR 5/6) and pale-brown (10YR 6/3) mottles; dark-brown (7.5YR 3/3) to very dark grayish-brown (7.5YR 3/2) clay coatings; strong-brown (7.5YR 5/8) specks; strong, medium, subangular blocky structure; very firm; mica flakes, worm casts, and iron concretions present; medium acid; gradual, smooth boundary.

B3—40 to 56 inches, dark-brown to brown (10YR 4/3) coarse silty clay loam; common, fine, faint, grayish-brown (10YR 5/2) and strong-brown (7.5YR 5/8) mottles; dark-brown to brown (7.5YR 4/3) clay organic coatings or oxide coatings; moderate, medium, subangular blocky structure; very firm; mica flakes, worm casts, and iron concretions present; slightly acid; abrupt, smooth boundary.

IIC—56 to 62 inches, dark-brown (7.5YR 3/2) sandy loam; massive; firm; slightly acid.

The surface layer ranges from very dark brown to dark brown and is 16 to 22 inches thick. Thickness of the subsoil ranges from 24 to 36 inches.

Plano soils are similar to the Onarga soils, but unlike them, formed in silty, rather than sandy, material. They are more acid than Harco soils.

Plano silt loam, 0 to 2 percent slopes (199A).—This soil has the profile described for the series. It is on terraces between Onarga fine sandy loams to the east and Harco silt loam to the west. The soil generally occupies areas that are lower than those occupied by Onarga soils and are somewhat higher than those occupied by Harco silt loam.

Included with this soil are some small areas of Harco silt loam and of Onarga soils.

This Plano soil is well suited to all crops commonly grown in the county and can be cultivated intensively. Lime and fertilizer are needed. In addition such practices as returning all crop residues to the soil are also needed. Management group I-1; not assigned to a woodland suitability group.

Plano silt loam, 2 to 4 percent slopes (199B).—This soil occupies long, narrow areas. It is near Plano silt loam, 0 to 2 percent slopes, and gently sloping, sandy Onarga soils, in higher areas, and somewhat poorly drained Marissa silt loam, in lower areas. The surface layer is dark brown to very dark grayish brown. It is not so thick as that in the profile described for the series.

Included with this soil are small areas of Plano silt loam, 0 to 2 percent slopes. Also included are some small areas of Marissa silt loam and of sandy Onarga soils.

The main limitation of this soil is the slope. Under good management the soil is well suited to all crops commonly grown in the county. Growing grasses and legumes in the cropping system, returning all crop residues to the soil, and farming on the contour can be used to control erosion. Lime and fertilizer also are needed. Management group IIe-1; not assigned to a woodland suitability group.

Racoon Series

Soils of the Racoon series are nearly level, light colored, and poorly drained. These soils are on foot slopes adjacent to uplands in the western part of the county. They formed in silty material washed from higher lying soils. The vegetation was a forest consisting of oak and hickory.

The surface layer generally is grayish silt loam more than 24 inches thick. The subsoil is grayish-brown to light brownish-gray silty clay loam.

These soils have high available moisture holding capacity and are very slowly permeable. They are very strongly acid, are very low in available phosphorous, and are low in available potassium.

Representative profile of Racoon silt loam on a slope of less than 1 percent, 35 feet north of a lane and 50 feet east of the road (NW10, SW40, SW160, sec. 31, T. 7 S., R. 8 E.):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

A21—9 to 18 inches, gray (10YR 5/1) silt loam; a few, coarse, prominent, strong-brown (7.5YR 5/6) mottles; weak to moderate, thin to medium, platy structure; friable; a few, large, prominent, dark-brown (7.5YR 3/2), soft iron concretions; strongly acid; clear, smooth boundary.

A22—18 to 28 inches, light brownish-gray (10YR 6/2) silt loam that is white (10YR 8/1) when dry; a few, fine, faint, grayish-brown (10YR 5/2) mottles and common, fine, distinct, brownish-yellow (10YR 6/6 and 6/8) mottles; weak, fine, granular structure; friable; common, fine, distinct, very dark brown (10YR 2/2) and yellowish-brown (10YR 5/6 and 5/8) iron concretions; many roots; vesicular; very strongly acid; clear, smooth boundary.

A2&B2—28 to 30 inches, light-gray (10YR 7/1) silt loam and grayish-brown (10YR to 2.5Y 5/2) silty clay loam; many, fine, faint, grayish-brown (10YR to 2.5Y 5/2) mottles in the silt loam; a few, fine, faint, pale-brown (10YR 6/3) mottles and a few, fine, faint, yellowish-brown (10YR 5/6 and 5/8) mottles in the silty clay loam; very weak, fine, granular structure in the silt loam, and weak to moderate, medium, subangular blocky structure in the silty clay loam; friable to firm; common, very fine pores; common, very fine, soft, very dark brown (10YR 2/2) and yellowish-brown (10YR 5/6 and 5/8) iron concretions; very strongly acid; abrupt, smooth boundary.

B2t—30 to 40 inches, grayish-brown (2.5Y 5/2) silty clay loam to light silty clay; a few, fine, distinct, light-gray (10YR 7/1) mottles and common, fine, distinct, yellowish-brown (10YR 5/6 and 5/8) mottles; moderate, medium to coarse, prismatic structure that breaks to moderate, medium, subangular blocky; very firm; very thin, continuous, grayish-brown (2.5Y 5/2) clay coatings; a few, fine, black (N 2/0) iron concretions; very strongly acid; clear, smooth boundary.

B3—40 to 44 inches, grayish-brown (2.5Y 5/2) to light brownish-gray (2.5Y 6/2) silty clay loam; a few, fine, distinct, gray (10YR 6/1) mottles and a few, fine, prominent, yellowish-brown (10YR 5/6 to 5/8) mottles; weak, coarse, subangular blocky structure; firm; very thin, patchy, grayish-brown (2.5Y 5/2) to light brownish-gray (2.5Y 6/2) silty coatings that are white (2.5Y 8/2) when dry; slightly acid; clear, smooth boundary.

C1—44 to 48 inches, mixed light brownish-gray (2.5Y 6/2) and gray (10YR 6/1) silt loam; a few, medium, distinct, yellowish-brown (10YR 5/6, 5/4, and 5/8) mottles; massive; friable to firm; a few, fine, prominent, very dark brown (10YR 2/2) iron concretions; moderately alkaline; clear, wavy boundary.

C2—48 to 56 inches, mixed light brownish-gray (2.5Y 6/2) and gray (10YR 6/1) silty clay loam; a few, medium, distinct, yellowish-brown (10YR 5/6, 5/4, and 5/8) mottles; massive; firm to friable; many, coarse, prominent, very dark brown (10YR 2/2) iron concretions; moderately alkaline; noncalcareous; abrupt, wavy boundary.

C3—56 to 60 inches, gray (10YR 6/1) to light brownish-gray (10YR 6/2) silt loam; a few, coarse, prominent, strong-brown (7.5YR 5/6) and dark-brown (7.5YR 3/2) mottles; massive; friable; moderately alkaline; noncalcareous.

The surface layer ranges from 26 to 36 inches in thickness, and the subsoil, from 10 to 20 inches. Texture of the subsoil ranges from silty clay loam to silty clay. The soil above the substratum ranges from very strongly acid to strongly acid, and the substratum ranges from strongly acid to neutral.

Racoon soils are similar to Wynoose and Weir silt loams but have a thicker surface layer and subsurface layer combined. Their subsoil is heavier than that in Bonnie soils.

Racoon silt loam (109).—This is the only Racoon soil mapped in the county. It is nearly level and is on foot slopes below sloping, light-colored soils of the uplands and above light-colored silty Belknap and Bonnie soils, on bottom lands. The areas are fairly long and narrow and are adjacent to irregular slopes in the uplands.

Included with this soil are small areas of Bonnie silt loam. Also included are some areas of Creal silt loam, 1 to 5 percent slopes, which is somewhat poorly drained.

The main limitations of Racoon silt loam are slow permeability, lack of organic matter, and poor tilth. This soil remains wet and cool until late in spring. It also crusts readily after a rainstorm. Drainage is needed to remove excess water. Surface drains can be used to provide drainage, but tile drains do not work well. Under good management, which includes adding lime and fertilizer, the soil is moderately well suited to all crops commonly grown in the county. Also needed are such practices as returning all crop residues to the soil, including grasses and legumes in the cropping system, and keeping tillage to a minimum. Management group IIIw-3; woodland suitability group 3.

Reesville Series

Reesville soils are deep, nearly level to gently sloping, light colored, and somewhat poorly drained. These soils are on broad terraces in the north-central part of the county. They formed in silty material 40 to 60 inches thick over medium-textured to moderately coarse textured sediment of Wisconsin glacial age. The vegetation was a forest consisting of gum, maple, walnut, and white and red oaks.

The surface layer is generally grayish-brown silt loam about 6 inches thick. Just below is grayish-brown silt loam that has granular and platy structure. At a depth of about 8 inches is mottled yellowish-brown to light olive-brown silty clay loam. The subsoil is about 24 inches thick. It is underlain by calcareous silt loam.

These soils have high available moisture holding capacity and are moderately slowly permeable to moderately permeable. They generally are slightly acid to neutral but range to strongly acid in some places. Reesville soils are low in available phosphorus and are medium in potassium.

Representative profile of a Reesville silt loam on a slope of less than 1 percent (NW corner of SE2½, SE10, NW40, NW160, sec. 2, T. 9 S., R. 8 E.):

Ap—0 to 6 inches, grayish-brown (10YR 5/2) silt loam; weak, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—6 to 8 inches, grayish-brown (10YR 5/2) silt loam; weak, medium, platy structure that breaks to weak, medium, granular; friable; slightly acid; abrupt, smooth boundary.

B21t—8 to 14 inches, yellowish-brown (10YR 5/4) to light olive-brown (2.5Y 5/4) silty clay loam; many, thin, light brownish-gray (10YR 6/2) root fillings; many, fine, faint, yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) mottles; weak, coarse, prismatic structure that breaks to weak, medium, subangular blocky; friable to firm; common white (10YR 8/1) silt coatings that are not visible when wet; a few iron and manganese concretions; neutral; clear, smooth boundary.

B22t—14 to 23 inches, yellowish-brown (10YR 5/4) to light olive-brown (2.5Y 5/4) heavy silty clay loam; a few, fine, faint, strong-brown (7.5YR 5/8) motles; moderate, medium to coarse, subangular blocky structure; firm; many very dark grayish-brown (10YR 3/2) iron concretions; very thin, continuous, brown (10YR 5/3) clay coatings; slightly acid; clear, smooth boundary.

B23t—23 to 29 inches, yellowish-brown (10YR 5/4) to light olive-brown (2.5Y 5/4) silty clay loam on ped exteriors; the ped interiors are somewhat lighter in color; common, medium, distinct, yellowish-brown (10YR 5/3) mottles; weak, medium, subangular blocky structure that breaks to weak, fine, subangular blocky; friable to firm; common, very thin, brown (10YR 5/3) clay films; many very dark grayish-brown (10YR 3/2) iron and manganese concretions; neutral; clear, smooth boundary.

B3—29 to 32 inches, light olive-brown (2.5Y 5/4) silt loam; many, fine, distinct, yellowish-brown (10YR 5/8) mottles; weak, medium, subangular blocky structure; friable; a few very dark grayish-brown (10YR 3/2) iron and manganese concretions; calcareous; clear, smooth boundary.

C1—32 to 35 inches, pale-brown (10YR 6/3) coarse silt loam; common, medium, faint, yellowish-brown (10YR 5/6 and 5/8) mottles; structureless; friable; calcareous; a few calcium concretions and iron and manganese concretions; clear, smooth boundary.

C2—35 to 45 inches, same as the C1 horizon, except the calcium concretions are more numerous and many snail shells are present.

The surface layer is grayish brown to dark brown in uneroded areas and is yellowish brown in moderately eroded areas. The subsoil is 18 to 28 inches thick. The soils generally are slightly acid to neutral but range to strongly acid in some places. Depth to calcareous material ranges from 24 to 40 inches.

Reesville soils are similar to Starks soils, but unlike them, their subsoil formed entirely in silty material. The subsoil of Starks soils contains much coarse material.

Reesville silt loam, 0 to 2 percent slopes (723A).—This soil has the profile described for the series. It is nearly level and is on broad terraces. Some of the areas are slightly elevated and are surrounded by dark-colored, poorly drained Patton silty clay loam. Other areas are adjacent to more sloping Reesville soils and to nearly level Sexton silt loam, which is poorly drained.

Included with this soil are small nearly level areas of poorly drained Sexton silt loam and of well-drained Uniontown soils. Also included are some areas of more sloping Reesville soils.

The main limitation of this Reesville soil is moderately slow permeability. In some places wetness is a problem, but tile can be used to provide drainage. If management otherwise is good, the soil is moderately well suited to all crops commonly grown in the county and can be cropped intensively. Practices needed are applying lime and fertilizer, returning all crop residues to the soil, and keeping tillage to a minimum. Management group IIw–2; woodland suitability group 1.

Reesville silt loam, 2 to 4 percent slopes (723B).—Some areas of this soil are on slope breaks below nearly level Reesville soils and above nearly level, darker colored, poorly drained Marissa and Patton soils. Other areas are below moderately sloping, well-drained Uniontown and Camden soils and above long, narrow, sloping areas of those soils, or in some places are above sandy Alvin soils. The surface layer is grayish brown to brown.

Included with this soil are small areas of nearly level, well-drained Uniontown soils. Also included are some areas of more sloping Reesville soils.

The main limitations of this Reesville soil are slope, slight hazard of erosion, and moderately slow to moderate permeability. If lime and fertilizer are added and if management otherwise is good, the soil is well suited to all crops commonly grown in the county. Growing grasses and legumes in the cropping system, returning all crop residues to the soil, and keeping tillage to a minimum are practices needed for controlling erosion. Because of the irregular shape of the areas, it is difficult to farm on the contour and to install terraces and diversions for control of erosion. Management group IIw–2; woodland suitability group 1.

Reesville silt loam, 2 to 4 percent slopes, eroded (723B2).—This soil is on slope breaks below nearly level Reesville soils and above nearly level, poorly drained, darker colored Marissa and Patton soils. The areas are long and narrow. Slopes are short and irregular.

Much of the original surface layer of this soil has been removed through erosion, and material formerly in the subsoil has been mixed with the remaining surface layer by plowing. The present surface layer is brown to yellowish brown and is slightly finer textured than that in the profile described for the series. It also is lower in organic matter and crusts more readily after a rainstorm. In addition runoff is greater and less water moves into the soil and is held available for crops.

Included with this soil are small areas of well-drained, moderately eroded Uniontown soils and small areas of Reesville soils that are not eroded. Also included are a few areas of Starks soils, which are underlain by coarse-textured material.

The main limitations of this Reesville soil are hazard of further erosion, moderately slow to moderate permeability, and crusting of the surface. If lime and fertilizer are applied and if erosion is controlled, tilth is improved, and permeability is increased, the soil is moderately well suited to well suited to the crops commonly grown. Practices needed are growing grasses and legumes in the cropping system, returning all crop residues to the soil, and keeping tillage to a minimum. The short, irregular slopes make terracing or farming on the contour difficult. Management group IIw–2; woodland suitability group 1.

Reesville silt loam, 4 to 7 percent slopes, eroded (723C2).—This soil is on broad terraces between other soils on terraces and soils on bottom lands. It is below nearly level and very gently sloping Reesville soils and above nearly level, darker colored, poorly drained Beaucoup and Wakeland soils. The areas are long and narrow. Slopes are short and irregular.

Much of the original surface layer of this soil has been removed through erosion, and material formerly in the subsoil has been mixed with the remaining surface layer by plowing. The present surface layer is yellowish brown and is slightly finer textured than that in the profile described for the series. In addition it is lower in organic matter and crusts more readily. Runoff also is greater, and less water moves into the soil and is held available for crops.

Included with this soil are small areas of well-drained, moderately eroded Uniontown soils and small areas of Reesville soils that are not eroded. Also included are some areas of Starks soils that are underlain by coarse-textured material.

The main limitations of this Reesville soil are hazard of further erosion, moderately slow permeability, and crusting of the surface. If lime and fertilizer are applied and if losses of soil and water are reduced, the soil is moderately well suited to all of the common grain crops and is well suited to hay and pasture. Practices needed are including grasses and legumes in the cropping system, returning all crop residues to the soil, growing cover crops, and keeping tillage to a minimum. The short, irregular slopes make terracing or farming on the contour difficult. Management group IIIe-3; woodland suitability group 1.

Reesville soils, 4 to 7 percent slopes, severely eroded (723C3).—These soils are on broad terraces between other soils on terraces and soils on bottom lands. They are below nearly level and very gently sloping Reesville soils and above nearly level, darker colored, poorly drained Darwin soils and light-colored, somewhat poorly drained Wakeland silt loam. The areas are long and narrow. Slopes are short and irregular.

Most of the original surface layer of these soils has been lost through erosion. Material formerly in the subsoil has been mixed with the remaining surface layer by plowing. The present surface layer consequently is mottled yellowish-brown and light brownish-gray silt loam to silty clay loam. It is finer textured than that in the profile described for the series. In addition it is lower in organic matter and contains more clay. It therefore crusts more readily and is more difficult to work. Runoff also is greater, and less water moves into the soil and is held available for crops. Depth to calcareous silt is about 26 inches.

Included with these soils are small areas of well-drained, severely eroded Uniontown soils and small areas of less eroded Reesville soils. Also included are some areas of Starks soils that are underlain by coarse-textured material.

Slopes and severe hazard of further erosion are the main limitations of these Reesville soils. The soils probably are better suited to small grain, hay, and pasture than to row crops. Even under good management, the soils are only poorly suited to row crops and moderately well suited to hay and pasture. Growing grasses and legumes in the cropping system most of the time, keeping tillage to a minimum, and returning all crop residues to the soils can be used for control of erosion. The irregular slopes make terracing and farming on the contour difficult. Management group IVe-2; woodland suitability group 1.

Roby Series

In the Roby series are nearly level to gently sloping, light-colored soils that are somewhat poorly drained. These soils are in the central and northeastern parts of the county in areas that range from 10 to 40 acres in size. The areas are long and are higher than the adjoining broad, level terraces. Roby soils formed in sandy clay loam underlain by sand. The vegetation was a forest consisting mainly of oak and hickory.

The surface layer typically is fine sandy loam throughout and is about 16 inches thick. It is dark grayish brown in the upper 9 inches and mixed dark grayish brown and grayish brown to brown below. The subsoil is mottled brown and grayish brown and is about 31 inches thick. It is friable to firm and is medium acid to very strongly acid.

These soils have moderate available moisture holding capacity. Permeability of the subsoil is moderately slow, but permeability of the sandy substratum is rapid. The soils are medium acid to very strongly acid and are low in available phosphorus and potassium. The content of organic matter is low.

Representative profile of a Roby fine sandy loam on a slope of about 1 percent (NE2½, SW10, NW40, SW160. sec. 30, T. 8 S., R. 10 E.):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, fine, granular structure; friable; neutral; abrupt, smooth boundary.

A21—9 to 13 inches, mixed dark grayish-brown (10YR 4/2) and grayish-brown to brown (10YR 5/2 to 5/3) fine sandy loam; weak, fine, granular structure; friable; slightly acid; clear, smooth boundary.

A22—13 to 16 inches, brown (10YR 5/3) fine sandy loam with thin streaks of dark grayish brown (10YR 4/2); weak, medium, granular structure; friable; medium acid; clear, smooth boundary.

B1—16 to 21 inches, brown (10YR 5/3) sandy clay loam; a few, fine, faint, grayish-brown (10YR 5/2) mottles; weak, fine and medium, subangular blocky structure; friable to firm; a few black (10YR 2/1) iron concretions; medium acid; clear, smooth boundary.

B21t—21 to 34 inches, mixed brown (10YR 4/3) and grayish-brown (10YR 5/2) clay loam; moderate, medium, subangular blocky structure; firm; continuous grayish-brown (10YR 5/2) clay films; common iron concretions; medium acid; gradual, smooth boundary.

B22t—34 to 40 inches, grayish-brown (10YR 5/2) clay loam; a few, medium, distinct, dark-brown (7.5YR 4/3) mottles; moderate to strong, medium and coarse, subangular blocky structure; firm; discontinuous brown (10YR 5/3) clay films on vertical ped faces; common very dark brown (10YR 2/2) iron concretions and streaks; very strongly acid; gradual, smooth boundary.

B3—40 to 47 inches, light brownish-gray (10YR 6/2) sandy clay loam; many, medium, distinct, dark-brown (10YR 4/3) to dark yellowish-brown (10YR 4/4) mottles; weak to moderate, coarse, subangular blocky structure; firm; patchy brown (10YR 5/3) clay films; many black (10YR 2/1) iron concretions; very strongly acid; gradual, smooth boundary.

C—47 to 50 inches +, mixed light brownish-gray (10YR 6/2), grayish-brown (10YR 5/2), brown (10YR 4/3), and yellowish-brown (10YR 5/6 and 5/8), stratified fine sand, clay loam, sandy clay loam, and fine sandy loam; massive; friable to firm; a few iron concretions; very strongly acid.

Texture of the surface layer ranges from very fine sandy loam to sandy loam. The subsoil ranges from sandy clay loam to clay loam in texture. Depth to loose sandy material underlying the subsoil ranges from 30 to 50 inches. Reaction is medium acid to very strongly acid.

Roby soils are similar to Alvin soils but have poorer drainage and duller colors throughout the profile and are more slowly permeable. They also are similar to Ruark soils but are not so poorly drained and have less abundant and less intense gray colors.

Roby fine sandy loam, 0 to 2 percent slopes (184A).—This soil has the profile described for the series. It occupies long, broad areas on terraces. The areas generally range from 10 to 60 acres in size. They are somewhat higher than adjoining, larger areas of moderately dark colored Marissa silt loam and Patton silty clay loam. In many places the areas are bordered by gently sloping Roby soils on ridges, by well-drained Alvin soils, and by well-drained Lamont fine sandy loams.

Included with this soil are small slightly eroded areas and small areas of poorly drained Ruark fine sandy loam. Also included are some areas of moderately well drained Alvin soils.

The main limitations of this Roby soil are wetness and moderately slow permeability. The soil remains wet and cool late in spring. It is easy to till and responds well to management. If lime and fertilizer are applied, and if management otherwise is good, the soil is moderately well suited to the common grain crops. Including grasses and legumes in the cropping system, growing cover crops, returning all crop residues to the soil, and similar practices can be used to increase permeability. Management group IIs–1; woodland suitability group 8.

Roby fine sandy loam, 2 to 7 percent slopes (184B).—This soil generally is below areas of nearly level Roby soils, of well-drained Alvin soils, and of well-drained Lamont fine sandy loams. It also is above nearly level, somewhat poorly drained, silty McGary soils and dark-colored, fine-textured Patton and Wabash soils. A few gently sloping areas are on ridgetops surrounded by lower lying McGary, Patton, and Wabash soils. The surface layer ranges from dark grayish brown to brown in color.

Included with this soil are small areas of Alvin, Lamont, and Ruark soils.

The main limitations of this soil are slopes and moderately slow permeability. Some areas are eroded, and here the surface soil is likely to crust after a rainstorm. The soil is easy to till. If lime and fertilizer are applied and if management otherwise is good, the soil is well suited to the crops commonly grown. Including grasses and legumes in the cropping system, growing cover crops, returning all crop residues to the soil, and similar practices can be used to control erosion and increase permeability. Management group IIe–4; woodland suitability group 8.

Ruark Series

Ruark soils are nearly level, light colored, and poorly drained. These soils are in the eastern part of the county. They formed in waterlaid sand and clay. The vegetation was a mixture of post oak, black oak, and hickory trees.

The surface layer typically is dark grayish brown fine sandy loam about 7 inches thick. It overlies light brownish-gray fine sandy loam about 6 inches thick. The subsoil, which is about 33 inches thick, is mottled gray heavy clay loam in the upper part and olive-brown heavy clay loam in the lower part. It is underlain by stratified sandy clay loam, sand, and sandy loam.

These soils have moderate available moisture holding capacity and are slowly permeable. They are medium acid to very strongly acid and are low in available phosphorus and potassium.

Representative profile of Ruark fine sandy loam on a slope of 0 to 2 percent, 25 feet north of the quarter section line and 40 feet east of the road (SE2½, SE10, NE40, NW160, sec. 30, T. 8 S., R. 10 E.):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) fine sandy loam; a few, fine, distinct, dark-brown (7.5YR 4/4) mottles in the lower part of this horizon; weak, fine, granular structure, friable; medium acid; abrupt, smooth boundary.

A2—7 to 13 inches, light brownish-gray (10YR 6/2) fine sandy loam; common, medium, distinct, brown (10YR 5/3) mottles; weak, medium, platy structure that breaks to weak, fine, granular; friable, strongly acid; abrupt, smooth boundary.

B21t—13 to 17 inches, gray (5Y 5/1) heavy clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles and a few, fine, faint, brown (10YR 5/3) mottles; weak, medium, prismatic structure that breaks to weak, medium, angular blocky; very firm; a few black (10YR 2/1) iron concretions; very strongly acid; gradual, smooth boundary.

B22t—17 to 27 inches, mixed gray (5Y 5/1) and olive (5Y 5/3 and 5/4) heavy clay loam; weak, coarse, prismatic structure that breaks to weak, medium and coarse, angular blocky; very firm; thin, continuous, gray (10YR 6/1) clay coatings; very strongly acid; gradual, smooth boundary.

B23t—27 to 39 inches, mixed gray (5Y 5/1), olive-brown (2.5Y 4/4), and light olive-brown (2.5Y 5/4) heavy clay loam; weak, coarse, prismatic structure that breaks to weak, coarse, angular blocky; firm; a very dark gray (5Y 3/1) krotovina; very strongly acid; gradual, smooth boundary.

B3—39 to 46 inches, mixed gray (5Y 5/1) and olive (5Y 5/6) clay loam; weak to moderate, medium, angular blocky structure; firm; a few, fine, black (10YR 2/1) iron concretions; slightly acid; clear, smooth boundary.

C1—46 to 52 inches, gray (5Y 6/1) sandy clay loam; massive; firm; neutral; abrupt, smooth boundary.

IIC2—52 to 60 inches, gray (10YR 6/1) to light brownish-gray (10YR 6/2) sand; massive; loose; neutral.

The surface layer ranges from light gray to dark grayish brown in color. It is 6 to 8 inches thick. The layer just below is gray to light brownish-gray fine sandy loam 6 to 12 inches thick. The subsoil ranges from 18 inches to 36 inches in thickness, and it is at a depth of 12 to 20 inches. Clay coatings in the subsoil range from gray to dark gray in color.

Ruark soils are similar to Sexton soils, but unlike them, are sandy, rather than silty. They have poorer drainage than Roby soils.

Ruark fine sandy loam (178).—This soil has the profile described for the series. It is nearly level and is below areas of gently sloping, somewhat poorly drained Roby soils or gently sloping, well-drained Alvin soils. The areas also are above areas of moderately dark colored Patton silty clay loam. The surface soil is low in content of organic matter and crusts readily.

Included with this soil are small areas of light-colored, somewhat poorly drained Roby soils. Also included are some small areas of gently sloping soils.

The main limitation of this soil is very slow permeability. Also, water ponds on the surface when rainfall is heavier than normal. Drainage is needed, and surface drains can be used to provide drainage. Tile drains do not work well. If drainage is provided and if tilth is improved and permeability is increased, the soil is well suited to all crops commonly grown in the county. Lime, fertilizer, and supplemental nitrogen should be applied, as needed. Other practices needed are growing grasses and legumes in the cropping system and returning all crop residues to the soil. Management group IIIw–1; woodland suitability group 3.

Sarpy Series

Sarpy soils are deep, very gently sloping to gently sloping, light colored, and well drained to excessively drained. These soils are nearly level and are on broad bottom lands adjacent to the Ohio and Wabash Rivers. They formed in deep deposits of sandy material laid down recently. In most places the vegetation consists of cottonwood and willow trees.

These soils typically are made up of grayish-brown to yellowish-brown sand that is variable in texture and extends to a depth of 60 inches. The sand consists mainly of coarse sand and medium sand but includes some fine sand.

Sarpy soils have very low available moisture capacity and are rapidly permeable. They are neutral to calcareous and are medium to high in available phosphorus and potassium.

Representative profile of Sarpy sand on a slope of about 5 percent, on the riverbank just south of half section line (sec. 6, T. 9 S., R. 11 E.):

C—0 to 60 inches, grayish-brown (10YR 5/2) to yellowish-brown (10YR 5/4) stratified coarse sand, medium sand, and some fine sand; some layers are light brownish gray (10YR 6/2); single grain; loose; calcareous.

The soil material ranges from coarse sand to loamy sand in texture. It is neutral to calcareous.

Sarpy soils are similar to Bloomfield soils, but unlike them, are calcareous and lack a developed subsoil. They also are coarser textured.

Sarpy sand (92).—This soil is very gently sloping to gently sloping. It occupies areas on bottom lands along the Ohio and Wabash Rivers above moderately dark colored, fine-textured Allison soils. It consists of deep deposits of sandy material laid down when the rivers were at flood stage.

This soil is better suited to trees than to other uses. The flooding hazard, very rapid permeability, and very low water-holding capacity are the main limitations. Management group VIIs–1; woodland suitability group 8.

Sawmill Series

In the Sawmill series are deep, nearly level, dark-colored soils that are poorly drained. These soils are on bottom lands along Cypress Ditch. They formed in silty clay loam material in swampy areas. The vegetation was grasses and sedges that could tolerate wetness.

The surface layer typically is very dark gray to black silty clay loam. It has weak blocky structure and is about 25 inches thick. Just below is silty clay loam that has blocky structure and is about 35 inches thick. This layer is mottled gray and olive and has some dark-colored material from the surface layer along the faces of the peds.

These soils have very high available moisture holding capacity and are moderately slowly permeable. They are slightly acid to neutral, medium to high in available phosphorus, and high in potassium.

Representative profile of Sawmill silty clay loam on a slope of less than 1 percent (SW corner of NW40, NE160, sec. 2, T. 9 S., R. 9 E.):

Ap—0 to 8 inches, very dark gray (10YR 3/1) to black (10YR 2/1) silty clay loam; moderate, medium and coarse, granular structure; friable to firm; many roots; slightly acid; abrupt, smooth boundary.

A11—8 to 11 inches, black (10YR 2/1) silty clay loam; weak, medium and thick, platy structure that breaks to weak, medium and coarse, subangular blocky; firm; many roots; common worm casts and wormholes; slightly acid; clear, smooth boundary.

A12—11 to 17 inches, black (10YR 2/1) silty clay loam; weak, medium, angular and subangular blocky structure that breaks to weak, medium, subangular blocky; firm; many roots; common worm casts and wormholes; slightly acid; clear, smooth boundary.

A13—17 to 25 inches, black (10YR 2/1) silty clay loam; weak, coarse, subangular blocky structure; firm; many roots; common worm casts and wormholes; slightly acid; clear, smooth boundary.

B21g—25 to 28 inches, mixed very dark gray (10YR 3/1), dark grayish-brown (2.5Y 4/2), and olive (5Y 4/3) silty clay loam; weak, coarse, subangular blocky structure; firm; many roots; common worm casts and wormholes; a few iron concretions; slightly acid; clear, smooth boundary.

B22g—28 to 50 inches, mixed olive-gray (5Y 4/2), olive (5Y 4/3), and very dark gray (5Y 3/1) silty clay loam; a few, fine, prominent, yellowish-brown (10YR 5/6) mottles; weak, coarse, subangular blocky structure; firm; nearly continuous very dark gray (10YR 3/1) coatings; common roots; a few iron concretions; a few worm casts and wormholes; neutral; gradual, smooth boundary.

B23g—50 to 60 inches, yellowish-brown (10YR 5/6) silty clay loam; many, fine, distinct, gray (N 5/0) mottles; weak, coarse, subangular blocky structure; firm; continuous black (N 2/0) coatings; common roots; small, common, iron concretions; a black (N 2/0) krotovina; neutral; gradual, smooth boundary.

C—60 to 72 inches, yellowish-brown (10YR 5/6) silt loam; many, medium, distinct, gray (N 5/0) mottles; massive; friable; a few roots; slightly acid.

The surface layer ranges from 24 to 36 inches in thickness. It is slightly acid to neutral. The subsoil is 20 to 36 inches thick and is slightly acid to neutral. In some places there is enough sand in the soil material to give a gritty feel to the soil.

Sawmill soils have a thicker, darker colored surface layer than Beaucoup soils. Their surface layer also is darker colored than that in Wabash soils, and unlike them, Sawmill soils are silty clay loam throughout.

Sawmill silty clay loam (107).—This is the only Sawmill soil mapped in the county. It is on bottom lands along the upper reaches of Cypress Ditch. The areas are somewhat lower than nearby Beaucoup soils, which have a thinner darker colored surface layer than this soil. They are somewhat higher than Wabash soils, which have more clay in all layers.

Included with this soil are small areas of Beaucoup and Wabash soils. Also included are some areas of Harpster soils, all layers of which contain snail shells and are calcareous. Other included areas have a deposit of silt loam 8 to 15 inches thick overlying the original silty clay loam surface layer.

The main limitations of Sawmill silty clay loam are wetness and the hazard of flooding. Drainage is needed, and tile drains can be used to provide drainage. The areas are not flooded annually, but the chance of flooding makes the growing of small grains risky. Under good management the soil is suited to all crops commonly grown in the county, and soybeans and corn can be grown intensively. A compact plowpan is likely to form unless tillage is done at the proper time, all crop residues are returned to the soil, and management is otherwise good. Lime generally is not needed, but if lime and fertilizer are applied, the common grain crops grow well. Management group IIw–6; not assigned to a woodland suitability group.

Sciotoville Series

In the Sciotoville series are nearly level to strongly sloping, light-colored soils that are moderately well drained and have a weak fragipan. These soils are on low terraces in the southeastern part of the county. They formed under oak and hickory trees in deep deposits of acid, silty sediment. The sediment was washed onto the areas from soils of the Ohio River watershed.

In most places the surface layer is friable, grayish-brown silt loam about 9 inches thick. The subsoil is yellowish brown in the upper part and brown to mixed gray and strong brown below. It is silty clay loam, has mostly blocky structure, and is about 43 inches thick. A weak fragipan is at a depth of about 34 inches.

These soils have high available moisture holding capacity. The layers above the fragipan are moderately permeable, and the fragipan is moderately slowly permeable. Sciotoville soils are strongly acid to very strongly acid, are low in available phosphorus, and are medium in available potassium.

Representative profile of a Sciotoville silt loam on a slope of about 2 percent, 330 feet west of a road (NE10, NE40, SW160, sec. 14, T. 10 S., R. 9 E.):

Ap—0 to 9 inches, grayish-brown (10YR 5/2) silt loam; weak, fine, crumb structure; friable; abrupt, smooth boundary.

B1—9 to 14 inches, yellowish-brown (10YR 5/4 to 5/6) silt loam; moderate, medium, subangular blocky structure; firm; strongly acid; clear, smooth boundary.

B21t—14 to 19 inches, yellowish-brown (10YR 5/4) silty clay loam; moderate, medium, subangular blocky structure; firm; strongly acid; clear, smooth boundary.

B22t—19 to 26 inches, brown (10YR 5/3) silty clay loam that is yellowish-brown (10YR 5/4) when crushed; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, angular blocky structure; firm; very strongly acid; clear, smooth boundary.

B23t— 26 to 34 inches, grayish-brown (10YR 5/2) to light brownish-gray (10YR 6/2) silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/4 to 5/6) mottles; light-gray (10YR 6/1) to light brownish-gray (10YR 6/2) coats on smaller peds; silt films present; blocky structure; firm; very strongly acid; clear, smooth boundary.

Bx—34 to 41 inches, mixed gray (10YR 5/1) to light brownish-gray (10YR 6/2) and strong-brown (7.5YR 4/5 to 4/6) silty clay loam; nearly continuous light-gray (10YR 4/1) to light brownish-gray (10YR 6/2) silt and clay films on the large peds; weak, coarse, prismatic structure to massive; common very dark grayish-brown (10YR 3/2) and very dark brown (10YR 2/2) manganese stains; very strongly acid; clear, smooth boundary.

B3—41 to 52 inches, strong-brown (7.5YR 5/6) medium to light silty clay loam that is dark brown (7.5YR 4/4) when crushed; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; many dark reddish-brown (5YR 3/2) manganese stains; weak, coarse, prismatic structure to massive; very strongly acid.

The surface layer ranges from grayish brown to brown in color and from 4 to 12 inches in thickness. The subsoil ranges from 24 to 45 inches in thickness. Generally the fragipan is weakly expressed, but in places it is moderately expressed.

Sciotoville soils have a weaker and thinner fragipan than Hosmer soils. They are somewhat better drained than Weinbach soils, and unlike them, have a fragipan.

Sciotoville silt loam, 0 to 2 percent slopes (462A).—Some areas of this soil are on fairly narrow, nearly level, low ridges near more sloping Sciotoville soils and somewhat poorly drained Weinbach soils. Other areas are slightly higher than nearby nearly level Weinbach soils, which are somewhat poorly drained. The surface layer is about 12 inches thick.

Included with this soil are small areas of nearly level and very gently sloping Weinbach soils. Also included are some areas of very gently sloping Sciotoville soils.

The main limitation of this Sciotoville soil is moderately slow permeability in the fragipan. In places excess water is a problem, but surface drains can be used to provide drainage. Under good management the soil is well suited to all of the crops commonly grown in the county. Good management consists of applying lime and fertilizer, returning all crop residues to the soil, and keeping tillage to a minimum. Including grasses and legumes in the cropping system is a way to increase permeability, improve tilth, and increase the supply of water held available for crops. Management group IIw–1; woodland suitability group 4.

Sciotoville silt loam, 2 to 4 percent slopes (462B).—This soil has the profile described for the series. Some areas are on ridges above nearly level Weinbach soils, which are somewhat poorly drained. Other areas are long and narrow and are below nearly level, poorly drained Sexton silt loam, or somewhat poorly drained Weinbach soils, and above poorly drained Karnak soils.

Included with this soil are small areas of nearly level and very gently sloping Weinbach soils and of gently sloping Sciotoville soils. Also included are some areas of Sciotoville soils that are moderately eroded and have a brown surface layer less than 7 inches thick. In these included areas the surface layer is lower in organic matter than the original one and it crusts readily after a rain.

The main limitations of this Sciotoville soil are slight hazard of erosion and moderately slow movement of water in the fragipan. If lime and fertilizer are applied and if management otherwise is good, the soil is well suited to the crops commonly grown. Practices needed for reducing loss of water and controlling erosion are growing grasses and legumes in the cropping system, returning all crop residues to the soil, and keeping tillage to a minimum. The irregular slopes make farming on the contour or installing terraces and diversions difficult. Management group IIe–3; woodland suitability group 4.

Sciotoville silt loam, 4 to 7 percent slopes, eroded (462C2).—Some areas of this soil are long and narrow and are below nearly level Weinbach soils that are somewhat poorly drained, or very gently sloping Sciotoville soils, and above poorly drained Karnak soils. Other areas occupy short irregular slopes in and around waterways that extend into areas of very gently sloping Weinbach soils.

All except 3 to 7 inches of the original surface layer of this soil has been removed through erosion. The present surface layer is brown, contains less organic matter than the original one, and is in poorer tilth. In addition runoff and the hazard of further erosion are greater, and less water moves into the soil and is held available for crops. Also the present surface layer crusts readily after a rainstorm.

Included with this soil are small areas of very gently sloping Weinbach soils and of other Sciotoville soils. Also included are some soils that have a surface layer that is more than 7 inches thick and some soils that are severely eroded and have a surface layer that is less than 3 inches thick.

The main limitations of this Sciotoville soil are hazard of further erosion, moderately slow movement of water in the fragipan, and moderate available water holding capacity. Under good management the soil is moderately well suited to the common grain crops and well suited to hay and pasture. Good management consists of applying lime and fertilizer, growing grasses and legumes in the cropping system, and keeping tillage to a minimum. These practices reduce loss of water, control erosion, and improve tilth. Management group IIIe–5; woodland suitability group 4.

Sciotoville silt loam, 7 to 12 percent slopes, eroded (462D2).—Some tracts of this soil are in long narrow areas below nearly level, somewhat poorly drained Weinbach soils and above poorly drained Karnak soils. Other areas are on short irregular slopes in and around waterways that extend into areas of very gently sloping Weinbach soils.

This soil has lost all except 3 to 7 inches of its original surface layer through erosion. The present surface layer is brown, contains less organic matter than the original one, and is in poorer tilth. In addition runoff and the hazard of further erosion are greater, and less water moves into the soil and is held available for crops. Also the surface layer crusts readily after a rainstorm.

Included with this soil are small areas of gently sloping Weinbach soils and of other Sciotoville soils. Also included are some soils that have a surface layer that is more than 7 inches thick and some soils that are severely eroded and have a surface layer that is brown and is less than 3 inches thick. Other included soils are somewhat poorly drained and have a very weak fragipan or lack a fragipan.

The main limitations of this Sciotoville soil are hazard of further erosion, moderately slow movement of water in the fragipan, and moderate available water holding capacity. Under good management the soil is moderately well suited to the common grain crops and is well suited to hay and pasture. Good management consists of applying lime and fertilizer, growing grasses and legumes in the cropping system, and keeping tillage to a minimum. These practices reduce loss of water, control erosion, and improve tilth. The size and shape of the areas make farming on the contour and installing terraces and diversions difficult. Management group IIIe-5; woodland suitability group 4.

Sciotoville silt loam, 12 to 25 percent slopes, eroded (462E2).—In some places this soil is on long narrow areas below nearly level Karnak soils that are somewhat poorly drained. In other places the soil occupies short irregular slopes in and around waterways that extend into areas of very gently sloping Weinbach soils.

The surface layer of this soil is brown and is 3 to 7 inches thick. Depth to the fragipan is about 18 inches.

Included with this soil are small areas of less sloping Sciotoville soils. Also included are some areas of soils that have a cover of trees and a surface layer that is more than 7 inches thick. Other included soils are severely eroded and have a surface layer that is less than 3 inches thick.

The main limitations of this Sciotoville soil are strong slopes, severe hazard of further erosion, moderately slow movement of water in the fragipan, and reduced water-holding capacity. Even under good management the soil is poorly suited to grain crops and is moderately well suited to hay and pasture. Practices that can be used to reduce loss of water and control erosion are adding lime and fertilizer, growing grasses and legumes in the cropping system most of the time, returning all crop residues to the soil, and keeping tillage to a minimum. The size and shape of the areas make farming on the contour and installing terraces and diversions difficult. Management group IVe–4; woodland suitability group 4.

Sexton Series

Sexton soils are nearly level, light colored, and poorly drained. These soils are in nearly level to depressional areas on broad terraces in the central part of the county. They formed in silty sediment under a forest consisting of black oak and hickory.

The surface layer generally is dark grayish-brown silt loam about 9 inches thick. Just below is gray to light-gray silt loam. The subsoil, which is at a depth of about 23 inches, is mottled gray to light-gray and strong-brown, dense silty clay loam. Some sand is present in the lower part of the subsoil, and the amount of sand increases with depth.

These soils have high available moisture holding capacity and are slowly permeable. They are very strongly acid to slightly acid, are low in available phosphorous, and are low to medium in available potassium. The dense subsoil at a depth of about 24 inches somewhat restricts growth of plant roots.

Representative profile of Sexton silt loam on a slope of less than 1 percent, 100 feet north and 100 feet east of a road (SW corner, SW10, SE40, NE160, sec. 4, T. 9 S., R. 9 E.):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; a few, fine, faint, gray (10YR 5/1) mottles; weak, fine, granular structure; friable; common brown (10YR 4/3) and dark-brown (10YR 3/3) iron stains; slightly acid; abrupt, smooth boundary.

A21—9 to 13 inches, gray to light-gray (10YR 6/1) silt loam that is light gray (10YR 7/1) to white (10YR 8/1) when dry; many pale-brown (10YR 6/3) to dark-brown (10YR 3/3) iron stains and splotches; massive to cloddy; appears to be a plowpan; friable when moist, but hard and somewhat fragile when dry; common iron concretions; slightly acid; gradual, smooth boundary.

A22—13 to 23 inches, gray to light-gray (10YR 6/1) silt loam that is light gray (10YR 7/1) to white (10YR 8/1) when dry; common, medium, distinct, dark-brown (10YR 3/3) and brown (10YR 5/3) splotches; weak, thin to medium, platy structure to massive; large vesicles; friable when moist, slightly hard when dry; many iron concretions; medium acid; abrupt, wavy boundary.

B21t—23 to 30 inches, mixed gray to light-gray (10YR 6/1) and strong-brown (7.5YR 5/6) silty clay loam; weak to moderate, coarse, prismatic structure; peds have thick gray to light-gray (10YR 6/1) silt coats that are white (10YR 8/1) when dry; firm when moist, hard when dry; common iron concretions; very strongly acid; clear, smooth boundary.

B22t—30 to 39 inches, mixed gray to light-gray (10YR 6/1) and strong-brown (7.5YR 5/6) silty clay loam; moderate, coarse, prismatic structure; peds have thick, continuous, gray (10YR 5/1) clay coatings; firm when moist, hard when dry; common iron concretions; very strongly acid; gradual, smooth boundary.

B23t—39 to 44 inches, mixed gray to light-gray (10YR 6/1) and strong-brown (7.5YR 5/6) silty clay loam; weak, coarse, prismatic structure; peds have discontinuous gray (10YR 5/1) clay coatings; firm when moist, hard when dry; a few small iron concretions; medium acid; gradual, smooth boundary.

B3—44 to 48 inches, yellowish-brown (10YR 5/6 to 5/8) light silty clay loam that feels somewhat gritty; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, coarse, prismatic structure to massive; firm to friable when moist, slightly hard when dry; patchy gray (10YR 5/1) clay coatings and fillings in root channels; a few small iron concretions; slightly acid; gradual, smooth boundary.

C—48 to 69 inches, yellowish-brown (10YR 5/6 to 5/8) silt loam that contains some sand in the upper part and ranges to loam in the lower part of this horizon; common, fine, distinct, gray (10YR 6/1) and light brownish-gray (10YR 6/2) mottles; massive; friable; a few small iron concretions; neutral.

The surface layer and subsurface layer combined range from 16 to 24 inches in thickness. The subsoil ranges from silty clay loam to silty clay in texture and from 18 to 28 inches in thickness. Depth to coarse-textured material ranges from 40 to 60 inches. In the solum reaction ranges from very strongly acid to slightly acid.

Sexton soils are similar to Racoon soils but have a somewhat thinner surface layer, and unlike them, have coarse material in the lower part of the subsoil and in the substratum.

Sexton silt loam (208).—This is the only Sexton soil mapped in the county. It is on broad terraces. The areas are nearly level to depressional, and in the central part of the county, they are near large areas of very gently sloping Starks and Reesville soils, which are somewhat poorly drained. In the eastern part of the county, the soil is on lower terraces near gently sloping Weinbach soils, which are somewhat poorly drained.

Included with this soil are small areas of nearly level, somewhat poorly drained Reesville, Starks, and Weinbach soils.

Because of slow permeability, low content of organic matter, and poor tilth Sexton silt loam remains wet and cool until late in spring. Drainage is needed, but tile drains are not suitable. Also because the soil is silty, a thick crust forms at the surface after a rain. The crust hinders emergence of seedlings and reduces intake of water.

If drainage is provided and if phosphorus, potash, and nitrogen are applied, the soil on terraces in the central part of the county is well suited to the crops commonly grown. On the lower terraces in the eastern part of the county, however, the soil is only fairly well suited to the common crops. Good tillage practices are needed to reduce crusting and to increase intake of water. In addition grasses and legumes should be included in the cropping system and all crop residues must be returned to the soil. Management group IIIw-3; woodland suitability group 3.

Shiloh Series

In the Shiloh series are deep, nearly level, dark-colored soils that are poorly drained and very poorly drained. These soils are on low terraces along Cypress Ditch, and along Crawford Creek just north of Ridgway or are in depressions on broad terraces in the north-central part of the county. They formed in swampy areas in silty clay material that settled out in still water during Wisconsin time. The vegetation consisted of swamp grasses and sedges and of sweetgum, ash, wild cherry, pecan, and water oak.

The surface layer typically is black to very dark gray silty clay. It is about 17 inches thick. The upper part is granular, and the lower part has blocky structure. The subsoil is very dark gray to gray silty clay and has yellowish mottles. It has blocky structure and is about 33 inches thick.

These soils have high available moisture holding capacity and are slowly permeable to moderately slowly permeable. They are slightly acid to mildly alkaline and become moderately alkaline with depth. Available phosphorus is low, and available potassium is low to medium.

Representative profile of Shiloh silty clay on a slope of 0 to 2 percent, about 700 feet south of a gravel road going from east to west and 60 feet east of a gravel road going from north to south (SW10, NW40, NW160, sec. 28, T. 8 S., R. 9 E.):

Ap—0 to 8 inches, black (10YR 2/1) to very dark gray (10YR 3/1) silty clay; strong, coarse, granular structure; firm when moist, extremely hard when dry; slightly acid; abrupt, smooth boundary.

A1—8 to 17 inches, black (10YR 2/1) to very dark gray (10YR 3/1) silty clay; a few, fine, faint, brownish-yellow (10YR 6/8) mottles; moderate, medium and fine, subangular blocky structure; firm; very dark gray (N 3/0) clay films; iron concretions present; neutral; gradual, smooth boundary.

B1g—17 to 26 inches, very dark gray (N 3/0) heavy silty clay; common, medium, distinct, light reddish-brown (2.5YR 6/4) mottles; strong, coarse and medium, subangular blocky structure; firm; very dark gray to dark-gray (N 4/0) thin clay coatings; mildly alkaline; clear, smooth boundary.

B21g—26 to 31 inches, very dark gray (N 3/0) heavy silty clay; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; strong, medium, subangular blocky structure; firm; very dark gray (N 3/0) to dark-gray (N 4/0) thin clay coatings; mildly alkaline; gradual, smooth boundary.

B22g—31 to 39 inches, gray (5Y 5/1) heavy silty clay; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; strong, coarse, medium and fine, subangular blocky structure; firm; dark-gray (5Y 4/1) thin clay coatings; mildly alkaline; gradual, smooth boundary.

B3g—39 to 50 inches, gray (5Y 5/1) silty clay; common, medium, prominent, yellowish-brown (10YR 5/8) mottles and a few, medium, distinct, pale-yellow (2.5Y 7/4) mottles; moderate to strong, coarse, subangular blocky structure; firm; dark-gray (5Y 4/1) thin clay coatings; lime and iron concretions are present; strongly effervescent; clear, smooth boundary.

C1g—50 to 90 inches, gray (N 5/0) heavy silty clay loam; many, coarse, prominent, strong-brown (7.5YR 5/8) mottles and many, medium, faint, greenish-gray (5BG 5/1) to bluish-gray (5B 5/1) mottles; massive; firm; violently effervescent; abrupt, smooth boundary.

IIC2—90 to 96 inches, dark-gray (N 4/0) to gray (N 5/0) fine sand; many, coarse, prominent, strong-brown (7.5 YR 5/8) mottles; loose; violently effervescent; abrupt, smooth boundary.

IIIC3—96 inches, sandy clay loam; violently effervescent.

In color the surface layer ranges from very dark gray to black. The solum ranges from silty clay to clay in texture. It is slightly acid to calcareous.

Shiloh soils are similar to Montgomery and Patton soils, but they are darker colored than Montgomery soils and finer textured than Patton soils.

Shiloh silty clay (138).—This is the only Shiloh soil mapped in the county. It is nearly level. Some areas are on low terraces near Cypress Ditch and near Crawford Creek north of Ridgway. Other areas are in depressions on broad terraces in the north-central part of the county.

In most places the areas are adjacent to very gently sloping, light-colored Alvin, Camden, and Uniontown soils.

Included with this soil are some areas on which silty sediment washed from higher lying soils has been deposited. The sediment is 8 to 15 inches thick. Also included are small areas of lighter colored Montgomery soils and of coarser textured Patton soils.

The main limitations of Shiloh silty clay are wetness and slow to moderately slow permeability. Drainage is needed, and tile can be used to provide drainage but drains the soil slowly. Under good management the soil is well suited to the crops commonly grown, though the clayey texture makes the soil not suited to intensive cropping. Including grasses and legumes in the cropping system helps to maintain tilth. Plowing in fall eases seedbed preparation in spring. Plowing the soil when wet should be avoided. Supplemental nitrogen and other fertilizer are needed. Lime should be applied if needed, though it generally is not needed. Management group IIw–7; woodland suitability group 11.

Starks Series

Starks soils are deep, nearly level to gently sloping, light colored, and somewhat poorly drained. These soils are on broad terraces in the central part of the county. They formed partly in silty sediment less than 40 inches thick, and partly in coarse-textured sediment. The native vegetation was a forest of white oak, red oak, gum, maple, and walnut.

The surface layer generally is dark grayish-brown to grayish-brown silt loam about 11 inches thick. It overlies a subsoil of mottled brown silty clay loam or silty clay to yellowish-brown sandy clay loam. The upper part of the subsoil formed from silty material, and the lower part, from more sandy material.

These soils have moderate to high available moisture holding capacity and are moderately permeable to moderately slowly permeable. They are medium acid to slightly acid, are low in available phosphorus, and are medium in available potassium.

Representative profile of a Starks silt loam on a slope of about 1 percent, 36 feet west of homestead fence NW2½, NE10, NE40, NW160, sec. 34, T. 8 S., R. 9 E.):

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

A2—8 to 11 inches, grayish-brown (10YR 5/2) silt loam; a few, fine, faint, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/4) mottles; some dark grayish-brown (10YR 4/2) channels; weak, thin, platy structure that breaks to weak, fine, granular; friable; common roots; vesicular; slightly acid; abrupt, smooth boundary.

B1—11 to 14 inches, brown (10YR 4/3) silty clay loam; a few, fine, faint, gray (10YR 6/1) mottles and a few, medium, faint, grayish-brown (10YR 5/2) mottles; weak to moderate, fine and very fine, subangular blocky structure; friable to firm; some soft, very dark brown (10YR 2/2) iron concretions; many roots; medium acid; clear, smooth boundary.

B21t—14 to 19 inches, brown (10YR 4/3) silty clay loam to silty clay; many, fine, faint, dark grayish-brown (10YR 4/2) and yellowish-brown (10YR 5/4 and 5/8) mottles; weak, medium, subangular blocky structure that breaks to moderate to strong, fine and very fine, angular blocky; firm; continuous, dark grayish-brown (10YR 4/2) clay coatings; common roots; many, soft, very dark brown (10YR 2/2) iron concretions; medium acid; clear, smooth boundary.

B22t—19 to 23 inches, yellowish-brown (10YR 5/6) silty clay loam to silty clay; a few, fine, faint, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/8) mottles; moderate, fine and medium, subangular blocky structure; firm; discontinuous dark grayish-brown (10YR 4/2) clay coatings; many, soft, very dark brown (10YR 2/2) iron concretions; common roots; slightly acid; clear, smooth boundary.

IIB23t—23 to 30 inches, yellowish-brown (10YR 5/4) sandy clay loam; many, fine, faint, yellowish-brown (10YR 5/6 to 5/8) mottles and a few, medium, faint, dark grayish-brown (10YR 4/2) mottles; weak to moderate, medium to coarse, angular blocky structure; friable; patchy dark grayish-brown (10YR 4/2) to light brownish-gray (2.5Y 5/2) clay coatings and dark-brown (10YR 3/3) old root channels; common to few roots; a few, soft and hard, very dark brown (10YR 2/2) iron concretions; slightly acid; gradual, smooth boundary.

IIB3—30 to 40 inches, yellowish-brown (10YR 5/6) sandy loam; a few, fine, faint, grayish-brown (10YR 5/2) mottles; weak, coarse, prismatic structure that breaks to weak, coarse, subangular blocky; a few, patchy, dark grayish-brown (10YR 4/2) clay films; friable to firm; neutral; clear, smooth boundary.

IIC—40 to 60 inches, yellowish-brown (10YR 5/6) stratified sandy loam, silt loam, loam, and loamy sand; many, medium, faint, grayish-brown (10YR 5/2) mottles; massive; friable; neutral.

The surface layer ranges from 12 inches in thickness in uneroded areas to less than 7 inches in eroded areas. It ranges from dark grayish brown in color in uneroded areas to mottled grayish brown to brown in eroded areas. Reaction ranges from medium acid to slightly acid. The thickness of the silty material ranges from 24 to 40 inches. In texture the substratum ranges from loam to loamy sand. Iron concretions are common on the nearly level areas but are lacking on the gently sloping areas.

Starks soils are similar to Camden soils but have poorer drainage. They also are similar to Reesville soils, but unlike them, their subsoil formed partly in silty material and partly in coarse-textured material.

Starks silt loam, 0 to 2 percent slopes (132A).—This soil has the profile described for the series. In some places the soil occupies fairly small round areas on terraces slightly above nearby nearly level, dark-colored, poorly drained Patton soils. In other places the soil occupies larger areas on terraces above gently sloping Starks soils and well-drained Camden soils.

Included with this soil are small areas of nearly level, poorly drained Sexton soils and of well-drained Camden soils. Also included are some areas of very gently sloping Starks soils.

This Starks soil is moderately well suited to all crops commonly grown in the county. It can be cultivated intensively, but a few wet areas require drainage if the soil is used intensively. Tile and surface drains can be used to provide drainage, though tile drains must be used with care because of occasional sand pockets. Needed for increasing permeability and improving tilth are such practices as applying lime and fertilizer, returning all crop residues to the soil, and growing green-manure crops. Management group IIw–2; woodland suitability group 1.

Starks silt loam, 2 to 6 percent slopes (132B).—Some areas of this soil are on low knolls partly or completely surrounded by lower lying, dark-colored, poorly drained Patton silty clay loam. Other areas are below nearly level

Starks soils or poorly drained Sexton silt loam and above nearly level Patton soils.

Included wih this soil are small areas of very gently sloping, well-drained Camden soils and of nearly level Starks soils. Also included are some moderately eroded Starks soils that have a surface layer less than 7 inches thick. Here the surface layer is lower in organic matter than that in the profile described for the series and crusts readily after a rain. In many of these eroded areas the surface layer also is somewhat finer textured because material formerly in the subsoil has been mixed with the remaining surface layer by plowing.

The main limitation of this Starks soil is irregular slopes, which make it difficult to farm on the contour and to install terraces and diversions for the control of erosion. If erosion is controlled, permeability is increased, and tillage is improved, this soil is well suited to the crops commonly grown in the county. Practices needed are adding lime and fertilizer and growing grasses and legumes in the cropping system. In addition all crop residues must be returned to the soil and tillage must be kept to a minimum. Management group IIw-2; woodland suitability group 1.

Stoy Series

In the Stoy series are deep, nearly level to gently sloping, light-colored soils that are somewhat poorly drained. These soils are in the uplands in the northwestern and western parts of the county. They formed in silty windblown material, or loess, more than 50 inches thick over Illinoian glacial drift or over material weathered from sandstone. The vegetation was a forest of oak and hickory.

The surface layer generally is silt loam about 13 inches thick. It is dark brown in the upper part and light yellowish brown and yellowish brown below. It overlies mottled yellowish-brown silty clay loam about 32 inches thick. The underlying material is loess.

These soils have high available moisture holding capacity, which can be increased somewhat under good management. They are slowly permeable. Stoy soils are strongly acid to very strongly acid, are very low in available phosphorus, and are low in available potassium.

Representative profile of a Stoy silt loam on a slope of about 3 percent (SE corner of SW40, SW160, sec. 28, T. 7 S., R. 8 E.):

Ap—0 to 6 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; a few iron concretions; abundant roots; very strongly acid; abrupt, smooth boundary.

A21—6 to 9 inches, mixed light yellowish-brown (10YR 6/4) and yellowish-brown (10YR 5/4) silt loam; a few, medium, faint, light brownish-gray (10YR 6/2) mottles; common, very dark grayish-brown (10YR 3/2) specks; weak, thin, platy structure that breaks to weak, fine, granular; friable; many small iron concretions; common roots; very strongly acid; clear, smooth boundary.

A22—9 to 13 inches, yellowish-brown (10YR 5/4) silt loam; common, medium, faint light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/6) mottles; weak, fine and medium, granular structure; friable; many small iron concretions; common roots; very strongly acid; clear, smooth boundary.

B1—13 to 16 inches, yellowish-brown (10YR 5/6) light silty clay loam; a few, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, fine and medium, subangular blocky structure; friable; many small iron concretions; common roots; very strongly acid; clear, smooth boundary.

B21t—16 to 24 inches, yellowish-brown (10YR 5/8) silty clay loam; a few, fine, faint, light brownish-gray (10YR 6/2) and brown (10YR 5/3) mottles; moderate to strong, fine, subangular blocky structure; peds have thick light brownish-gray (10YR 6/2) silt coats that are light gray (10YR 7/1) when dry; firm; many, small, hard iron concretions; common roots; very strongly acid; clear, smooth boundary.

B22t—24 to 27 inches, mixed yellowish-brown (10YR 5/8 and 5/4) silty clay loam; a few, fine, faint, light-gray (10YR 7/1) mottles; moderate, coarse, subangular blocky structure that breaks to moderate to strong, fine and very fine, angular blocky; firm; thick, continuous, light brownish-gray (10YR 6/2) silt coats that are very distinct on the larger peds; continuous dark-brown (10YR 4/3) clay coatings on the small angular peds that break from the larger subangular peds; many iron concretions about one-eighth inch in diameter; many black (10YR 2/1) specks and streaks; common roots; very strongly acid; clear, smooth boundary.

B23t—27 to 32 inches, mixed yellowish-brown (10YR 5/8 and 5/4) silty clay loam to silty clay; a few, fine, faint, light-gray (10YR 7/1) and light brownish-gray (10YR 6/2) mottles; moderate, medium, subangular blocky structure; very firm; continuous dark-brown (10YR 4/3) clay coatings; common roots; many small iron concretions; some splotches of black (10YR 2/1) iron stains or streaks; very strongly acid; gradual, smooth boundary.

B31—32 to 36 inches, mixed grayish-brown (10YR 5/2), brown (10YR 5/3), and yellowish-brown (10YR 5/8) light silty clay loam; a few, fine, faint, light-gray (10YR 7/1) mottles; weak, coarse, subangular blocky structure; discontinuous, dark-brown (10YR 4/3) clay coatings; firm; common roots; many small iron concretions; very strongly acid; gradual, smooth boundary.

Bx—36 to 45 inches, mixed grayish-brown (10YR 5/2), brown (10YR 5/3), and yellowish-brown (10YR 5/8) light silty clay loam; common, fine to medium, faint, light-gray (10YR 7/1) mottles; weak, coarse, prismatic structure to massive; patchy dark-brown (10YR 4/3) clay coatings; extremely firm; many small iron concretions; very strongly acid; gradual, smooth boundary.

C1x—45 to 65 inches, mixed grayish-brown (10YR 5/2), pale-brown (10YR 6/3), yellowish-brown (10YR 5/8), and light-gray (10YR 7/1) silt loam; weak, medium, prismatic structure to massive; extremely firm; very dark grayish-brown (10YR 3/2) specks and splotches; a few to no roots; many small iron concretions; very strongly acid.

The surface layer ranges from 17 inches in thickness in uneroded areas to 4 inches in moderately eroded areas. Its color ranges from light brownish gray to yellowish brown. Gray silt coatings are more intense on slopes of less than 1 percent and less intense on slopes of more than 5 percent. Iron concretions are common on nearly level areas but are lacking on gently sloping areas.

Stoy soils are similar to Bluford soils but formed in thicker deposits of loess. Unlike Hosmer soils their subsoil is mottled throughout. In contrast to Wynoose and Weir soils, Stoy soils lack gray and light-gray mottles in the surface layer and are better drained.

Stoy silt loam, 0 to 2 percent slopes (164A).—This soil is in the uplands above Stoy silt loam, 2 to 4 percent slopes. The areas are slightly higher than areas of Wynoose and Weir silt loams, which occupy slightly depressional areas within large areas of this soil. The surface layer ranges from very dark grayish brown to dark brown.

Included with this soil are small areas of nearly level, poorly drained Wynoose and Weir silt loams. Also included are some areas of Stoy silt loam, 2 to 4 percent slopes.

The main limitation of this soil is slow permeability. Excess water is a problem in some places, but surface ditches can be used to drain these areas. Tile drains are not satisfactory. Under good management the soil is well suited to all crops commonly grown in the county. Good management consists of adding lime and fertilizer. It also consists of using such practices as returning all crop residues to the soil and of keeping tillage to a minimum. Management group IIw–3; woodland suitability group 1.

Stoy silt loam, 2 to 4 percent slopes (164B).—This soil has the profile described for the series. Some of the areas are on broad ridgetops above sloping Hosmer soils. Other areas are on the edge of slope breaks between sloping Hosmer soils and Stoy silt loam, 0 to 2 percent slopes, or Wynoose and Weir silt loams.

Included with this soil are small areas of Stoy silt loam, 0 to 2 percent slopes, and of nearly level, moderately well drained Hosmer soils.

The main limitations of this Stoy soil are slow permeability and slight hazard of erosion. Under good management the soil is well suited to all crops commonly grown in the county. Good management consists of adding lime and fertilizer. It also consists of using such practices as returning all crop residues to the soil, keeping tillage to a minimum, and including grasses and legumes in the cropping system. Farming on the contour and terracing help in the control of erosion, but these practices can be used only if ways are provided to safely remove excess water. Management group IIw–3; woodland suitability group 1.

Tice Series

Soils of the Tice series are deep, nearly level to gently sloping, dark colored to moderately dark colored, and somewhat poorly drained. These soils generally are on bottom lands along the Ohio and Wabash Rivers. They formed under hardwoods in silty clay loam deposited by streams.

In most places the surface layer is very dark grayish-brown silty clay loam about 9 inches thick. The subsoil, a very dark grayish-brown to dark grayish-brown silty clay loam, is mottled with dark brown to dark gray. It has blocky structure and is about 35 inches thick.

These soils have high available moisture holding capacity and are moderately permeable to moderately slowly permeable. They are neutral to slightly acid, are moderate in available phosphorus, and are medium to high in available potassium. Restriction to development of plant roots generally is slight, though compaction is likely to occur in areas cropped intensively.

Representative profile of Tice silty clay loam on a slope of less than 1 percent, 100 feet south of the Wabash River and 300 feet east of the half section line (SW10, NW40, NE160 sec. 25, T. 8 S., R. 10 E.):

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) silty clay loam; weak, coarse, angular blocky structure; firm; neutral; abrupt, smooth boundary.

B1—9 to 17 inches, very dark grayish-brown (10YR 3/2) silty clay loam; weak, fine and medium, prismatic structure that breaks to weak to moderate, fine and medium, subangular and angular blocky; slightly firm; continuous dark-gray (10YR 4/1) and very dark gray (10YR 3/1) coatings; neutral; gradual, smooth boundary.

B21—17 to 23 inches, dark grayish-brown (10YR 4/2) silty clay loam; a few, fine, faint, dark-brown (10YR 3/3 and 4/3) mottles; weak, medium, prismatic structure that breaks to weak to moderate, angular blocky; slightly firm; continuous dark grayish-brown (10YR 4/2) to very dark grayish-brown (10YR 3/2) coatings; neutral; clear, smooth boundary.

B22—23 to 33 inches, dark grayish-brown (10YR 4/2) silty clay loam; a few, fine, faint, dark-gray (10YR 4/1) to very dark gray (10YR 3/1) and dark-brown (10YR 4/3 to 3/3) mottles; weak, medium, prismatic structure that breaks to weak, coarse, angular blocky; friable; discontinuous dark grayish-brown (10YR 4/2) to very dark grayish-brown (10YR 3/2) coatings; a few very small iron concretions; neutral; clear, smooth boundary.

B3—33 to 44 inches, dark grayish-brown (10YR 4/2) silty clay loam; common, fine, faint, brown (10YR 4/3) mottles; weak, coarse, angular blocky structure; friable; patchy dark grayish-brown (10YR 4/2) coatings; dark-gray (10YR 4/1) root fillings; neutral; gradual, smooth boundary.

C—44 to 70 inches +, mixed dark-gray (10YR 4/1), dark grayish-brown (10YR 4/2), brown (10YR 4/3), and dark yellowish-brown (10YR 4/4) silty clay loam; friable; neutral.

The subsoil ranges from 24 to 36 inches in thickness. It is light silty clay loam to heavy silty clay loam in texture.

Tice soils have a grayer subsoil than Allison soils and are more poorly drained. They are not so poorly drained, however, as Beaucoup and Petrolia soils, nor are they so light colored as Petrolia soils.

Tice silty clay loam (284).—This is the only Tice soil mapped in the county. It is on bottom lands. In most places the areas are broad and nearly level to gently sloping and are below moderately well drained and well drained Allison silty clay loam and above poorly drained Beaucoup and Petrolia soils. Some areas, however, are adjacent to sloughs and have slopes of as much as 12 percent. These areas are long, narrow, and irregular.

Included with this soil are small areas of moderately well drained to well drained Allison silty clay loam. Also included are some areas of poorly drained Beaucoup silty clay loam.

The main limitation of Tice silty clay loam is frequent flooding early in spring. The soil therefore is restricted to summer crops. Under good management this soil is well suited to corn and soybeans and can be cropped intensively. The plow layer, however, is likely to become dense and compact unless tillage is done at the proper time and all crop residues are returned to the soil. Phosphorus, potassium, and nitrogen are needed. Lime should be applied if needed, but it generally is not needed. Management group IIw–6; woodland suitability group 9.

Uniontown Series

Uniontown soils are deep, nearly level to moderately sloping, light colored, and moderately well drained to well drained. These soils are on broad terraces in the north-central part of the county. They formed in silty material 40 to 60 inches thick over stratified, medium-textured to moderately fine textured sediment of Wiscon-

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sin glacial age. The vegetation was a forest of white oak, gum, maple, and walnut.

The surface layer generally is friable, dark grayish-brown silt loam about 5 inches thick. Just below is dark-brown to yellowish-brown silty clay loam about 25 inches thick.

These soils have high available moisture holding capacity and are moderately permeable. They are strongly acid to mildly alkaline, are low in available phosphorus, and are about medium in available potassium.

Representative profile of a Uniontown silt loam on a slope of about 3 percent, 30 feet west of the center of the road, under the south wire of the powerline (NE½, NE 10, NE40, NE160, sec. 5, T. 9 S., R. 8 E.):

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; moderately alkaline; abrupt, smooth boundary.

B21t—5 to 9 inches, dark yellowish-brown (10YR 4/4) silty clay loam; discontinuous dark-brown (7.5YR 4/4) clay films on ped faces; a few yellowish-brown (10YR 5/4) worm casts; a few, very fine, black (N 2/0) iron concretions; moderate, fine, subangular and angular blocky structure; firm; strongly acid; clear, smooth boundary.

B22t—9 to 15 inches, dark-brown (7.5YR 4/4) to yellowish-brown (10YR 5/5) heavy silty clay loam in ped interiors and dark-brown (10YR 4/3) continuous clay films on ped exteriors and in root channels; some black (N 2/0) stains and soft very fine iron concretions; moderate, fine and medium, prismatic structure that breaks to strong, medium, subangular blocky; firm; medium acid; clear, smooth boundary.

B23t—15 to 18 inches, yellowish-brown (10YR 5/6) heavy silty clay loam in ped interiors and discontinuous dark-brown (7.5YR 3/2) clay films on ped exteriors and in root channels; some black (N 2/0) iron stains and iron concretions; the concretions are very fine and weak; moderate, medium, prismatic structure that breaks to weak, coarse, subangular blocky; firm; mildly alkaline; clear, smooth boundary.

B3—18 to 30 inches, yellowish-brown (10YR 5/6) silty clay loam; patchy brown (7.5YR 4/2) clay films and a few, fine, faint, pale-brown (10YR 6/3) mottles; weak, medium, prismatic structure that breaks to weak, coarse, subangular blocky; friable to firm; mildly alkaline; some medium-sized calcium concretions; abrupt, smooth boundary.

C—30 to 60 inches, brown (10YR 4/3) silt loam stratified with thin silty clay loam lenses; many, fine, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles and a few, fine, faint, yellowish-brown (10YR 5/4) mottles; structureless; friable; effervescent; a few, very fine, soft iron concretions; hard, fine and medium-sized, calcium concretions.

The surface layer ranges from dark grayish brown to brown in color. Reaction of the surface layer and of the subsoil ranges from medium acid to mildly alkaline. Depth to calcareous material ranges from 30 to 70 inches in areas that are not severely eroded.

Uniontown soils are similar to Camden soils, but unlike them, their subsoil formed entirely in silty material. They also are similar to Reesville soils but are free of brownish-gray mottles.

Uniontown silt loam, 0 to 2 percent slopes (482A).—In some places this soil occupies slightly elevated areas on terraces surrounded by nearly level, darker colored, poorly drained Patton silty clay loam. In other places the soil is on terraces surrounded by nearly level, somewhat poorly drained Reesville soils. The areas range from 1 to about 40 acres in size.

In most places the lower part of the subsoil of this soil is faintly mottled with yellowish brown. The mottles become grayish with depth.

Included with this soil are small areas of nearly level, somewhat poorly drained Reesville soils. Also included are some areas of very gently sloping Uniontown soils.

This Uniontown soil is well suited to all crops commonly grown in the county. It can be cultivated intensively, though many areas are too small to farm as individual units and are used the same as adjoining soils. Lime and fertilizer are needed. In addition all crop residues must be returned to the soil and other simple soil management practices used. Management group I–2; woodland suitability group 2.

Uniontown silt loam, 2 to 4 percent slopes (482B).—This soil generally occupies somewhat elevated areas on terraces surrounded by light-colored, somewhat poorly drained Reesville soils and dark-colored, poorly drained Patton silty clay loam. Some areas, however, occupy irregular slopes on terraces below nearly level, somewhat poorly drained Reesville soils or are intermingled with areas of other Uniontown soils. The surface layer is thicker than that in the profile described for the series.

Included with this soil are small areas of nearly level and very gently sloping, somewhat poorly drained Reesville soils, and of very gently sloping, sandy Alvin soils. Also included are some areas of other Uniontown soils and of some moderately eroded Uniontown soils. In the moderately eroded included areas, material formerly in the subsoil has been mixed with the remaining surface soil by plowing. As a result the present surface layer is brown to light yellowish brown and is somewhat finer textured than that in the profile described for the series. It also contains less organic matter and crusts more readily. Runoff therefore is greater and less water moves into the soil and is held available for crops.

The main limitations of this Uniontown soil are slopes and slight hazard of erosion. Under good management the soil is moderately well suited to all crops commonly grown in the county. Good management consists of adding lime and fertilizer. It also consists of using such practices for control of erosion as growing grasses and legumes in the cropping system and returning all crop residues to the soil. Management group IIe–2; woodland suitability group 2.

Uniontown silt loam, 4 to 7 percent slopes, eroded (482C2).—In some places this soil is on slope breaks below more gently sloping Uniontown soils and above darker colored Marissa silt loam. In other places the soil has short, irregular slopes and occupies long narrow areas in and around waterways that extend into very gently sloping areas of somewhat poorly drained Reesville soils.

In most places much of the original surface layer has been removed through erosion, and material formerly in the subsoil has been mixed with the remaining surface layer by plowing. The present surface layer is yellowish brown and is slightly finer textured than that in the profile described for the series. It also contains less organic matter and crusts more readily. Runoff therefore is greater and less water moves into the soil and is held available for crops.

Included with this soil are small areas of Camden soils, which are shallower to coarse-textured material than this soil, and some areas of very gently sloping Reesville soils.

Also included are some areas of other Uniontown soils and of Uniontown soils that have a grayish-brown to brown surface layer more than 7 inches thick.

The main limitations of this soil are slopes and hazard of further erosion if the soil is cultivated intensively. Under good management the soil is well suited to the crops commonly grown. Good management consists of adding lime and fertilizer, including grasses and legumes in the cropping system, returning all crop residues to the soil, and keeping tillage to a minimum. Because of the irregular slopes, it is difficult to farm on the contour and to install terraces and diversions for control of erosion. Management group IIe–2; woodland suitability group 2.

Uniontown soils, 4 to 7 percent slopes, severely eroded (482C3).—In some places these soils are on slope breaks below more gently sloping Uniontown soils and above darker colored, poorly drained Patton silty clay loam. In other places slopes are short and irregular and the areas are long and narrow. These areas are in and around waterways that extend into less sloping areas of other Uniontown soils.

Most of the original surface layer of these soils has been removed through erosion, and in many places part of the subsoil has been washed away. Less than 3 inches of the original surface layer remains, and plowing has mixed material formerly in the subsoil with the remaining surface layer. The present surface layer is dark yellowish brown and ranges from fine silt loam to silty clay loam in texture. It is low in organic matter and crusts more readily than that in less eroded Uniontown soils. Because of severe erosion, runoff is greater and less water moves into the soils and is held available for crops.

Included with these soils are small areas of Camden soils, which are shallower to coarse-textured material than these soils. Also included are some areas of sandy Alvin soils and some areas of Uniontown soils that are less eroded and less sloping than these soils. The surface layer of these included soils ranges from fine sandy loam to silty clay loam in texture.

The main limitations of these Uniontown soils are slopes and severe hazard of further erosion. If erosion is controlled, if permeability and water-holding capacity are increased, and if tilth is improved, these soils are moderately well suited to all crops commonly grown in the county. Practices needed are adding lime and fertilizer, growing grasses and legumes in the cropping system, returning all crop residues to the soils, and keeping tillage to a minimum. The irregular slopes make it difficult to farm on the contour, to install terraces and diversions, and to use similar practices for control of erosion. Management group IIIe–3; woodland suitability group 2.

Uniontown silt loam, 7 to 16 percent slopes, eroded (482D2).—Some areas of this soil are in and around waterways that extend into areas of gently sloping Uniontown soils or very gently sloping, somewhat poorly drained Reesville soils. Other areas are long and narrow and are below less sloping Uniontown soils and above nearly level, somewhat poorly drained Wakeland silt loam or dark-colored, poorly drained Darwin soils.

Much of the original surface layer of this soil has been removed through erosion, and material formerly in the subsoil has been mixed with the remaining surface layer by plowing. The present surface layer is yellowish brown and is slightly finer textured than that in the profile described for the series. It contains less organic matter than that in less eroded Uniontown soils and crusts more readily. As a result runoff is greater and less water moves into the soil and is held available for crops. Depth to the calcareous silty substratum generally is less than 18 inches.

Included with this soil are small areas of moderately sloping Camden soils, which are shallower to coarse-textured material than this soil. Also included are some areas of sandy Alvin soils and of other Uniontown soils.

The main limitations of this soil are slopes and hazard of further erosion if the soil is cultivated intensively. Under good management the soil is well suited to all crops commonly grown in the county. Good management consists of adding lime and fertilizer, including grasses and legumes in the cropping system, returning all crop residues to the soil, and keeping tillage to a minimum. The irregular slopes make it difficult to use such practices for the control of erosion as farming on the contour and installing terraces and diversions. Management group IIIe–3; woodland suitability group 2.

Uniontown soils, 10 to 25 percent slopes, severely eroded (482E3).—In some places these soils occupy areas in and around waterways that extend into areas of gently sloping Uniontown soils and of gently sloping, somewhat poorly drained Reesville soils. In other places the soils are in long narrow areas below less sloping Uniontown soils and above nearly level, somewhat poorly drained Wakeland silt loam or dark-colored, poorly drained Darwin soils.

Most of the original surface layer of these soils has been lost through erosion. In places all of the subsoil has been washed away and the calcareous underlying material is exposed. The present surface layer is dark yellowish brown, ranges from fine silt loam to silty clay loam in texture, and is less than 3 inches thick. It is more clayey than that in the profile described for the series. It also is less permeable, contains less organic matter, and is in poorer tilth. Runoff therefore is greater, and less water moves into the soils and is held available for crops. The subsoil is about 14 inches thick.

Included with these soils are small areas of moderately sloping Camden soils, which are underlain by coarse-textured material. Also included are some areas of sandy Alvin soils and of other Uniontown soils. The surface layer of these included soils ranges from fine sandy loam to silty clay loam in texture.

The main limitations of these soils are slopes and severe hazard of further erosion. A cover of hay or pasture plants or of trees should be kept on the areas. The clayey surface layer makes it difficult, however, to prepare and establish a seedbed for hay or pasture. If erosion is controlled and if management otherwise is good, the soils are moderately well suited to well suited to hay and are well suited to pasture. Lime and fertilizer are needed to keep a good cover of grasses and legumes on the soils and thus control erosion. Management group VIe–1; woodland suitability group 2.

Wabash Series

In the Wabash series are deep, nearly level, dark-colored soils that are poorly drained. These soils are in depressions on bottom lands along Cypress Ditch, north of Junction. They formed in deep deposits of very fine sediment laid down in still water in swampy areas, where large amounts of organic matter accumulated.

In most places the surface layer is very dark gray silty clay to black clay. It has blocky structure and is about 23 inches thick. The subsoil is black clay that becomes very dark gray with depth. It has weak blocky structure and contains much bog iron. In some places snail shells occur in all layers and the soil is calcareous throughout because the sediment was laid down where snails thrived. These areas are shown on the detailed soil map by the spot symbol, a dot with a circle around it.

These soils have moderate available moisture holding capacity and are slowly to very slowly permeable. They generally are slightly acid to neutral, are medium to high in available phosphorus, and are high in available potassium. The areas that are calcareous are low in available phosphorus and available potassium.

Representative profile of Wabash silty clay on a slope of less than 1 percent, 200 feet south of a ditch, 50 feet west of a road (NW10, SW40, SW160, sec. 16, T. 9 S., R. 9 E.):

Ap—0 to 8 inches, very dark gray (10YR 3/1) silty clay; weak, fine and very fine, angular blocky structure; very firm; slightly acid; abrupt, smooth boundary.

A1—8 to 23 inches, black (10YR 2/1) clay; weak, coarse, angular blocky structure; very firm; common, medium, prominent, strong-brown (7.5YR 5/6) stains from bog iron; fine, hard, common iron concretions; slightly acid; clear, smooth boundary.

Bg—23 to 32 inches, black (10YR 2/1) clay; weak, coarse, prismatic structure that breaks to weak, medium and coarse, angular blocky; very sticky and very plastic; many, coarse, prominent, strong-brown (7.5YR 5/6) stains from bog iron, which comprise 35 percent of the volume; common, fine, hard iron concretions; slightly acid; abrupt, smooth boundary.

Cg—32 to 50 inches, very dark gray (N 3/0) to black (N 2/0) clay; a few strong-brown (7.5YR 5/6) specks of bog iron and black (10YR 2/1) iron concretions; massive; very sticky and very plastic; moderately alkaline; noncalcareous.

The surface layer ranges from silty clay to clay in texture. The dark colors extend from about 24 inches to a depth of several feet. Reaction ranges from slightly acid to moderately alkaline.

Wabash soils have a thicker, darker colored surface layer than Darwin soils. They have more clay in all layers than Sawmill soils.

Wabash silty clay (83).—This is the only Wabash soil mapped in the county. It is on bottom lands in fairly wide, long, depressional areas. The areas range from 30 to 100 acres in size. They are somewhat lower than Darwin soils, which have a thinner surface layer than this soil, and they also are somewhat lower than Montgomery soils, which are on low terraces.

Included with this soil are small areas of Darwin soils and of Sawmill silty clay loam. Also included are some small areas of soils along the upper reaches of Cypress Ditch that have some sand in all layers.

The main limitations of Wabash silty clay are very slow permeability, hazard of flooding, and the clayey surface layer. Because the soil is clayey, preparing a seedbed is difficult. In areas farmed intensively, a dense compact layer, or plowpan, forms if the soil is plowed when wet. Plowing is best done in fall. Drainage is needed, and surface drains can be used to provide drainage. Use of tile for drainage is not suitable.

This soil is suited to most crops commonly grown in the county. The flooding hazard makes the growing of small grains risky. Practices needed for increasing permeability and improving tilth are growing green-manure crops and returning all crop residues to the soil. In addition tillage must be kept to a minimum and done only when the soil is dry enough. Fertilizer is needed. Areas that are calcareous are high in lime, and on these rocks phosphate is not suitable. Lime should be applied if needed, though it generally is not needed. Management group IIIw-5; woodland suitability group 11.

Wakeland Series

Wakeland soils are deep, nearly level, light colored, and somewhat poorly drained. Some areas of these soils are on bottom lands along Eagle Creek and the lower reaches of the Saline River. Other areas occupy many small bottoms that extend into broad terraces and into uplands in the southern part of the county. Wakeland soils formed in deep deposits of medium acid to mildly alkaline, silty sediment. The vegetation was a forest of oak, maple, gum, and elm.

The surface layer, a dark grayish-brown silt loam, is about 9 inches thick. Just below is dark grayish-brown to brown silt loam also about 9 inches thick. At a depth between 18 and 30 inches is dark grayish-brown silt loam that is mottled with light brownish gray. Below a depth of 30 inches, the material is gray to dark gray and is mottled with pale brown.

These soils have high available moisture holding capacity and are moderately permeable. They are medium acid to mildly alkaline, and are low to medium in available phosphorus, and are medium in available potassium.

Representative profile of Wakeland silt loam on a slope of less than 1 percent (NE10, NE40, NE160, sec. 14, T. 9 S., R. 9 E.):

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, crumb structure; friable; mildly alkaline; abrupt, smooth boundary.

A1—6 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; many, medium, faint, very dark grayish-brown (10YR 3/2) mottles; weak, fine, crumb structure; friable; mildly alkaline; clear, smooth boundary.

C1—9 to 18 inches, mixed dark grayish-brown (10YR 4/2) to brown (10YR 5/3) silt loam; tends toward weak, coarse, prismatic structure; friable; neutral; clear, smooth boundary.

C2—18 to 30 inches, dark grayish-brown (10YR 4/2) silt loam; many, medium, faint, light brownish-gray (10YR 6/2) mottles; massive; friable; neutral; clear, smooth boundary.

C3—30 to 35 inches, dark-gray (10YR 4/1) silt loam; many pale-brown (10YR 6/3) mottles; massive; friable; neutral; gradual, smooth boundary.

C4—35 to 60 inches, dark-gray (10YR 4/1) sandy loam to loam; many, medium, distinct, pale-brown (10YR 6/3) mottles; single grain; slightly acid.

In color the surface layer ranges from dark grayish brown to brown. Depth to dark-gray colors in the underlying layers generally is 24 inches, but in places it is as little as 20 inches. Reaction generally is slightly acid but ranges from medium acid to mildly alkaline.

Wakeland soils are not so acid as Belknap soils and are not so poorly drained as Birds soils.

Wakeland silt loam (333).—This is the only Wakeland soil mapped in the county. It is nearly level and is on broad bottoms along the Saline River and along Eagle

Creek. The areas are slightly higher than nearby areas of poorly drained Birds silt loam and somewhat poorly drained Dupo silt loam.

Included with this soil are small areas of poorly drained Birds soils and of somewhat poorly drained Dupo soils, which are underlain by dark-colored, fine-textured sediment.

The main limitations of this soil are wetness and occasional flooding. Drainage is needed, and under good management, tile can be used to provide drainage. Flooding generally occurs late in winter or early in spring and damage to crops is slight. If drainage is provided and if permeability is increased and tilth is improved, the soil is moderately well suited to all grain crops commonly grown in the county. The areas are being farmed intensively. Practices needed are applying lime and fertilizer, returning all crop residues to the soil, and keeping tillage to a minimum. Management group IIw-4; woodland suitability group 9.

Wallkill Series

In the Wallkill series are deep, nearly level, moderately dark colored soils that are poorly drained. These soils occupy nearly level to depressional areas in old, abandoned river channels and in closed sloughs. They are in the eastern part of the county. Wallkill soils formed under swamp vegetation in silty clay loam sediment. The sediment is 12 to 30 inches thick over muck or peat.

The surface layer is silty clay loam about 22 inches thick. It is dark gray to very dark gray in the upper part and dark gray in the lower part. Just below is dark grayish-brown to very dark gray muck.

These soils have high available moisture holding capacity. Permeability is moderate to moderately slow in the surface layer and moderate to moderately rapid in the subsoil. Wallkill soils are medium acid to neutral.

Representative profile of Wallkill silty clay loam, wet, on a slope of less than 1 percent, 200 feet east of the last pole of the powerline, on the east side of the road (NE10, NE40, SE160, sec. 13, T. 8 S., R. 9 E.):

A11—0 to 11 inches, dark-gray (2.5Y 4/1) to very dark gray (2.5Y 3/1) silty clay loam; many, medium prominent, yellowish-red (5YR 4/6) mottles; weak to moderate, fine and medium, granular structure; friable to firm; medium acid; abrupt, smooth boundary.

A12—11 to 22 inches, dark-gray (N 4/0) silty clay loam; weak, medium, subangular blocky structure; sticky; neutral; abrupt, smooth boundary.

IIC1—22 to 25 inches, very dark grayish-brown (10YR 3/2) to very dark gray (10YR 3/1) muck; massive; nonsticky; slightly acid; gradual, smooth boundary.

IIC2—25 to 45 inches, very dark grayish-brown (10YR 3/2) to dark-brown (10YR 3/3) peat; massive; nonsticky; slightly acid; abrupt, smooth boundary.

IIIC3—45 inches +, dark-gray (N 4/0) to gray (N 5/0) clay loam; massive; sticky; slightly plastic; neutral.

The surface layer ranges from 20 to 30 inches in thickness and from dark gray to black in color. Thickness of the organic material ranges from 10 inches to several feet.

Wallkill soils are somewhat lighter colored than Sawmill soils, and unlike them, are underlain by peat or muck at a depth of less than 30 inches.

Wallkill silty clay loam, wet (W464).—This is the only Wallkill soil mapped in the county. It is in depressions, in closed sloughs, and in abandoned river channels. The areas are below nearby light-colored Karnak soils and dark-colored Wabash silty clay, both of which are not underlain by organic material.

Included with this soil are some small areas of light-colored Karnak soils and of dark-colored Wabash soils.

The water table is at or near the surface of Wallkill silty clay loam, wet, all of the time. Trees cover most of the areas (fig. 14). The soil is better suited to trees or to use as habitat for wildlife than to other uses. Management group VIIw-1; woodland suitability group 12.

Weinbach Series

In the Weinbach series are deep, nearly level to gently sloping, light-colored soils that are somewhat poorly drained. These soils are on low terraces along the flood plain of the Ohio River. They formed under a forest of oak and hickory in deep deposits of acid sediment laid down on former flood plains.

In most places the surface layer is dark grayish-brown to brown, acid silt loam about 8 inches thick. It overlies brown to yellowish-brown silt loam that has platy structure and is about 15 inches thick. The subsoil is mixed light brownish-gray and strong-brown, acid silty clay loam that is about 22 inches thick. Below a depth of 45 inches is stratified silty clay loam, sandy clay loam, and sandy loam.

These soils have high available moisture holding capacity and are slowly permeable. They generally are very strongly acid, are low in available phosphorus, and are low to medium in potassium.

Representative profile of a Weinbach silt loam on a slope of about 1 percent, 25 feet east of an old farm lane

Figure 14.—**Trees on ponded areas of Wallkill silty clay loam, wet.**

and 150 feet north of a road (SW40, SW160, sec. 23, T. 10 S., R. 9 E.):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) to brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; strongly acid; abrupt, smooth boundary.

A21—8 to 13 inches, brown (10YR 4/3 to 5/3) silt loam; moderate, thin and medium, platy structure; friable; brown (10YR 5/3) to pale-brown (10YR 6/3) ped faces; very strongly acid; clear, smooth boundary.

A22—13 to 23 inches, brown (10YR 5/3) to yellowish-brown (10YR 5/4) silt loam; many, medium to coarse, light brownish-gray (10YR 6/2) to light-gray (10YR 7/2) mottles; weak, thick, platy structure that breaks to weak, fine, granular; friable; a few, fine, faint, yellowish-brown (10YR 5/6), soft iron concretions; very strongly acid; clear, smooth boundary.

B1—23 to 26 inches, mixed light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/6 and 5/8) light silty clay loam; weak to moderate, medium, subangular blocky structure; firm; very strongly acid; clear, smooth boundary.

B21t—26 to 31 inches, mixed light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/6 and 5/8) silty clay loam; moderate, medium, subangular blocky structure; firm; very strongly acid; clear, smooth boundary.

B22t—31 to 40 inches, yellowish-brown (10YR 5/4) silty clay loam; a few, fine, distinct, gray (10YR 6/1) mottles; weak, medium, prismatic structure that breaks to weak, coarse, subangular blocky; firm; common, very fine, distinct, very dark brown (10YR 2/2) iron concretions; medium acid; clear, smooth boundary.

B3—40 to 45 inches, dark yellowish-brown (10YR 4/4) silty clay loam that feels gritty; a few, fine, distinct, light brownish-gray (10YR 6/2) to gray (10YR 6/1) mottles; weak, very coarse, subangular blocky structure; friable to firm; common, medium, distinct, black (10YR 2/1) iron stains; slightly acid; gradual, smooth boundary.

C—45 to 70 inches, dark yellowish-brown (10YR 4/4) stratified silty clay loam, sandy clay loam, and sandy loam; massive; friable to firm; common, medium, distinct, black (10YR 2/1) iron stains; neutral.

The surface layer ranges from 6 to 24 inches in thickness, and from dark grayish brown to yellowish brown in color. The subsoil ranges from 14 to 24 inches in thickness. Mica flakes occur throughout the profile and range from a few small flakes to common and somewhat larger flakes. In places this soil has a weakly developed fragipan in the lower part of the B horizon.

Weinbach soils are more permeable, less fertile, and more acid than Reesville soils. The material from which they formed differs greatly from that in which Reesville soils formed.

Weinbach silt loam, 0 to 2 percent slopes (461A).—This soil has the profile described for the series. It is on low terraces. The areas generally are irregular in shape and are between areas of nearly level, poorly drained Sexton silt loam and gently sloping, moderately well drained Sciotoville soils. Some areas are slightly elevated and are surrounded by areas of Sexton silt loam.

Included with this soil are some small areas of Sexton silt loam and of very gently sloping Sciotoville soils.

The main limitation of this Weinbach soil is moderately slow to slow permeability. Some areas are wet. Surface ditches can be used to drain these areas, but tile drains are not satisfactory. The soil is subject to flooding when the water in the Ohio River is high. If lime and fertilizer are applied and if management otherwise is good, the soil is well suited to all grain crops commonly grown in the county. Practices needed are returning all crop residues to the soil and keeping tillage to a minimum. Management group IIw–3; woodland suitability group 1.

Weinbach silt loam, 2 to 4 percent slopes (461B).—This soil is on low terraces in the eastern part of the county. Some areas are on long irregular slopes between areas of poorly drained Sexton silt loam and Weinbach silt loam, 0 to 2 percent slopes, or moderately well drained Sciotoville soils. Other areas are intermingled with areas of poorly drained Karnak soils, which are on bottom lands. The surface layer is brown and is about 12 inches thick.

Included with this soil are small areas of Weinbach silt loam, 0 to 2 percent slopes, and of gently sloping, moderately well drained Sciotoville soils.

The main limitations of this Weinbach soil are moderately slow to slow permeability and slight hazard of erosion. The soil is subject to flooding when the water in the Ohio River is high. If lime and fertilizer are applied and if management otherwise is good, the soil is well suited to all crops commonly grown. Practices that can be used for reducing erosion are growing grasses and legumes in the cropping system, returning all crop residues to the soil, and keeping tillage to a minimum. Permanent measures, such as farming on the contour and use of terraces and diversions, also help to control erosion, but they cannot be used unless ways of removing excess surface water are obtained. Management group IIw–3; woodland suitability group 1.

Weir Series

In the Weir series are nearly level, light-colored soils that are poorly drained and have a claypan. These soils are in nearly level to depressional areas in the uplands in the northwestern part of the county. They formed in windblown silt, or loess, more than 50 inches thick. The underlying material is weathered clay loam to loam glacial drift of Illinoian age or is material weathered from sandstone. A forest consisting of post oak, blackjack oak, and hickory made up the original vegetation.

The surface layer generally is grayish-brown silt loam about 8 inches thick. Just below is mottled gray silt loam about 12 inches thick. The subsoil, which is a claypan, is at a depth of about 20 inches. It is mottled gray silty clay loam to silty clay. At a depth of about 42 inches is mixed gray, light brownish-gray, and yellowish-brown silt loam.

These soils have high available moisture holding capacity and are slowly permeable. They generally are very strongly acid, are very low in available phosphorus, and are low in available potassium. Growth of plant roots and movement of water into and through the soil are somewhat restricted by the claypan subsoil.

In this county the Weir soils occur in an intricate pattern with the Wynoose soils. They are therefore mapped only in a complex with those soils. The description of this complex follows the description of the Wynoose soils in this survey.

Representative profile of a Weir silt loam on a slope of less than 1 percent, 30 feet west of the road and 20 feet north of a farm lane (SE10, SW40, SE160, sec. 29, T. 7 S., R. 8 E.):

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; a few, coarse, faint, dark-brown (10YR 3/3) mottles; weak, fine and medium, granular structure; friable;

common iron concretions; many roots; slightly acid; abrupt, smooth boundary.

A21—8 to 12 inches, gray (10YR 6/1 to 7/1) silt loam; a few, fine, faint, light-gray (10YR 7/2) mottles and a few, fine, prominent, brownish-yellow (10YR 6/6) mottles; weak, medium, platy structure that breaks to weak, medium, granular; friable; vesicular; common iron concretions; a few roots; very strongly acid; clear, wavy boundary.

A22—12 to 20 inches, gray (10YR 6/1 to 7/1) silt loam; a few, fine, faint, white (10YR 8/1) and light-gray (10YR 7/2) mottles and a few, fine, prominent, brownish-yellow (10YR 6/6) mottles; weak, medium, granular structure; friable; vesicular; common iron concretions; a few roots; very strongly acid; clear, wavy boundary.

A&B—20 to 23 inches, gray (10YR 5/1 to 6/1) silty clay loam and light-gray (10YR 7/1) to white (10YR 8/1) silt loam; the silty clay loam has a few, coarse, distinct, yellowish-brown (10YR 5/6) mottles; many, coarse, faint, light brownish-gray (2.5Y 6/2), thick silt coats completely surround the peds of silty clay loam; weak to moderate, medium, subangular blocky structure; firm; common roots; common iron concretions; very strongly acid; abrupt, irregular boundary.

B21t—23 to 30 inches, gray (10YR 5/1) heavy silty clay loam to silty clay; many, medium, faint, grayish-brown (10YR 5/2) mottles and common, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, prismatic structure that breaks to moderate, fine and medium, subangular blocky; firm; continuous gray (10YR 5/1) to grayish-brown (2.5Y 5/2) clay coatings and some light-gray (10YR 7/1) silt coatings in the upper part of this horizon and along cleavage planes; common iron concretions; common roots; very strongly acid; clear, smooth boundary.

B22t—30 to 36 inches, gray (10YR 5/1) heavy silty clay loam to silty clay; many, medium, distinct, yellowish-brown (10YR 5/6) mottles and common, medium, faint, grayish-brown (10YR 5/2) mottles; moderate, fine and medium, subangular blocky structure; firm; nearly continuous gray (10YR 5/1) to grayish-brown (2.5Y 5/2) clay coatings; many iron concretions; common roots; very strongly acid; clear, smooth boundary.

B3—36 to 42 inches, gray (10YR 5/1) light silty clay loam; many, fine, distinct, yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) mottles; weak, coarse, subangular blocky structure; firm; patchy gray (10YR 5/1) to grayish-brown (2.5Y 5/2) clay coatings; many iron concretions; a few roots; very strongly acid; gradual, smooth boundary.

C—42 to 50 inches, mixed gray (10YR 5/1), light brownish-gray (2.5Y 6/2), and yellowish-brown (10YR 5/6 and 5/8) silt loam; white (10YR 8/1) specks; massive; firm to friable; many iron concretions; very strongly acid.

The surface layer and subsurface layer combined range from 18 to 24 inches in thickness. In color the subsurface generally is gray to light gray and has some prominent brownish-yellow mottles, but in some places the soil lacks such mottles. Reaction ranges from strongly acid to extremely acid.

Weir soils are similar to Wynoose soils, but their claypan is less developed and they formed in deeper deposits of loess. They also are similar to Racoon soils, but their surface layer and subsurface layer combined are less thick.

Wellston Series

Wellston soils are shallow to moderately deep, gently sloping to moderately steep, light colored, and well drained. These soils are in the southern part of the county on slope breaks, in waterways, in narrow areas along bottom lands, and in large areas on moderately steep, complex slopes. They formed in silty material less than 30 inches thick over sandstone bedrock or over material weathered from sandstone. A forest consisting of oak and hickory covered the areas.

In most places the surface layer is brown silt loam about 7 inches thick. The subsoil is mixed strong-brown and yellowish-brown silt loam in the uppermost part and strong-brown silty clay loam below. Depth to sandstone material is about 30 inches.

These soils have low to moderate available moisture holding capacity and are moderately permeable. They generally are very strongly acid, are low in available phosphorus, and are high in available potassium.

Representative profile of a Wellston silt loam on a slope of about 16 percent, in a roadbank on the north side of the road, 35 feet east of the lightpole, where the road turns southward (NW40, SE160, sec. 10, T. 10 S., R. 8 E.):

Ap—0 to 7 inches, brown (10YR 5/3) silt loam; many, fine, faint, dark grayish-brown (10YR 4/2) mottles; weak, very fine and fine, granular structure; friable; strongly acid; abrupt, smooth boundary.

B1—7 to 11 inches, mixed strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/6) silt loam; weak, very fine and fine, subangular blocky structure; friable; many very fine pores; very strongly acid; clear, wavy boundary.

B21—11 to 24 inches, strong-brown (7.5YR 5/6) silty clay loam; weak to moderate, fine to medium, subangular blocky structure; slightly firm; yellowish-red (5YR 5/6) clay coatings and pore fillings; very strongly acid; abrupt, irregular boundary.

B22—24 to 30 inches, strong-brown (7.5YR 5/6) silty clay loam; weak to moderate, fine and medium, subangular blocky structure; slightly firm; yellowish-red (5YR 5/6) clay coatings and pore fillings; 50 to 80 percent of the volume consists of gravelly to channery rock; very strongly acid; abrupt, irregular boundary.

R—30 to 32 inches, loamy fines make up 10 percent of the horizon, and gravelly to channery rock, 90 percent; cannot dig further with spade.

In thickness the surface layer ranges from less than 1 inch in severely eroded areas to 7 inches in relatively uneroded areas. The color of the surface ranges from very dark grayish brown to yellowish brown. The subsoil ranges from 10 to 24 inches in thickness. Depth to sandstone material ranges from 30 to 60 inches.

Wellston soils have fewer fragments of rock in the surface layer and subsoil than Berks soils, and they have a more clayey subsoil. They are similar to the Zanesville soils, but unlike them, have no fragipan and are shallower to sandstone material.

Wellston silt loam, 5 to 12 percent slopes, eroded (339D2).—This soil is in and around waterways that extend into less sloping areas of Zanesville soils, which are somewhat deeper to sandstone material and have a fragipan. The surface layer is yellowish brown in color.

Included with this soil are small areas of more strongly sloping Wellston soils and of gently sloping Zanesville soils. Also included are some soils that are severely eroded and that have less than 3 inches of their original surface soil remaining.

The main limitations of this Wellston soil are slopes, moderate available moisture holding capacity, shallow to moderately deep rooting depth, and low fertility. Growth of crops is restricted during short, dry periods because of the low available moisture holding capacity. Even under good management growth of the common crops generally is poor. Growing grasses and legumes in the cropping system most of the time helps to prevent further erosion. Also needed are such practices as adding lime and fertilizer, returning all crop residues to the soil, and keeping tillage to a minimum. Waterways are difficult to establish because of exposed sandstone bedrock in the bottoms of the waterways. Management group IVe–4; woodland suitability group 6.

Wellston silt loam, 12 to 18 percent slopes, eroded (339E2).—Areas of this soil are in and around the upper part of waterways that extend into less sloping areas of Hosmer and Zanesville soils, which have a fragipan and are deeper to sandstone than this soil. They generally are above Wellston-Berks complex, 12 to 60 percent slopes, eroded. The surface layer of this soil is very dark grayish brown in wooded areas but is dark yellowish brown in cultivated areas.

Included with this soil are small areas of other Wellston soils and of moderately sloping Hosmer and Zanesville soils.

The main limitations of this Wellston soil are slopes, low available moisture holding capacity, shallow to moderately deep rooting depth, and low fertility. Erosion is a severe hazard if this soil is cultivated. Even during short dry spells, growth of crops is restricted by lack of moisture. The soil is better suited to pasture, woodland, or recreational use than to other uses. Lime and fertilizer are needed if the areas are used for pasture. Waterways are difficult to establish because of exposed sandstone bedrock in the bottoms of the waterways. Management group VIe–2; woodland suitability group 6.

Wellston soils, 12 to 18 percent slopes, severely eroded (339E3).—These soils occupy areas in and around the upper part of waterways that extend into less sloping areas of Hosmer and Zanesville soils, which have a fragipan and are deeper to sandstone than these soils. The areas generally are above Wellston-Berks complex, 12 to 60 percent slopes, eroded.

Most of the original surface layer of these soils has been eroded away. The present surface layer therefore contains somewhat more clay than the original one. It is yellowish brown in color and ranges from silt loam to silty clay loam in texture.

Included with these soils are small areas of less eroded Wellston soils. Also included are some areas of moderately sloping Hosmer and Zanesville soils.

The main limitations of these Wellston soils are slopes, severe erosion hazard, low available water holding capacity, shallow to moderately deep rooting depth, and low fertility. Even during short, dry spells, growth of crops is restricted by lack of moisture. These soils are better suited to woodland or to recreational use than to other uses. Management group VIIe–1; woodland suitability group 6.

Wellston silt loam, 18 to 30 percent slopes, eroded (339F2).—This soil occupies areas in and around the upper part of waterways that extend into less sloping areas of Zanesville soils, which have a fragipan and are deeper to sandstone material than this soil.

The surface layer is dark grayish brown to yellowish brown. The subsoil, a light silty clay loam, is about 12 inches thick. Fragments of sandstone are at a depth of about 18 inches.

Included with this soil are small areas of other Wellston soils. Also included are some areas of strongly sloping and moderately steep Zanesville soils.

The main limitations of this Wellston soil are slopes, shallow rooting depth, low available water holding capacity, and fertility. Even during short dry spells, growth of crops is restricted by lack of moisture. The soil is better suited to woodland or recreational use than to other uses. Management group VIIe–1; woodland suitability group 6.

Wellston-Berks complex, 12 to 60 percent slopes, eroded (986F2).—This mapping unit occupies strongly rolling to hilly areas in the southwestern part of the county, mainly in the Shawnee National Forest. It consists of Wellston and Berks soils that occur in small areas in such a complex pattern they cannot be mapped separately. The areas are in waterways, on ridges, and on areas between ridges. Slopes are convex or are concave and vary in length. The Wellston soil occupies the ridges and the convex slopes, and the Berks soil generally is in the waterways and in the concave slopes.

The surface layer is dark brown to very dark brown and ranges from 2 to 9 inches in thickness. The Wellston part of the complex is free of cobblestones or other stones to a depth of 10 inches, but the Berks part may have rock fragments on the surface. In the Wellston soil, the subsoil consists of silty clay loam that is relatively free of rock fragments. The subsoil of the Berks soils, however, contains a large amount of cobbly or channery material.

Included with this mapping unit are some soils that have many large rocks on the surface.

The main limitations of the soils in this mapping unit are the slopes, the many rocks and rock outcrops, the very low available water holding capacity, and the shallow rooting zone. Most areas are in trees. The soils are better suited to trees and to recreational use than to other uses (fig. 15). Management group VIIe–1; woodland suitability group 6.

Worthen Series

In the Worthen series are deep, nearly level to very gently sloping, dark-colored soils that are moderately well drained to well drained. These soils generally are close to Shawneetown Hills, north of Shawneetown, and to Gold Hill, south of Junction. They formed under grass in deep deposits of silty material washed from loess-covered uplands.

The surface layer generally is very dark gray, friable silt loam about 20 inches thick. Just below is black to very dark brown and dark brown to brown, friable silt loam about 9 inches thick. The subsoil is dark yellowish-brown, friable silt loam that has weak blocky structure and is about 18 inches thick. The underlying material is dark-brown to brown silt loam.

These soils have very high available moisture holding capacity and are moderately permeable. They are slightly acid to neutral and are high in available phosphorus and potassium. The content of organic matter and supply of nitrogen are medium to high.

Figure 15.—**A rocky area of Wellston-Berks complex, 12 to 60 percent slopes, eroded. Such areas provide scenic surroundings for recreational development.**

Representative profile of Worthen silt loam on a slope of about 1½ percent (NE. corner of NW40, NW160, sec. 9, T. 9 S., R. 10 E.):

A1—0 to 20 inches, very dark gray (10YR 3/1) silt loam; weak, fine, granular structure; friable; slightly acid; gradual, smooth boundary.

A3—20 to 29 inches, black (10YR 2/1) to very dark brown (10YR 2/2) and dark-brown to brown (10YR 4/3) silt loam; fine granular structure; friable; slightly acid; clear, smooth boundary.

B2—29 to 47 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; weak subangular blocky structure to granular; friable; slightly acid; gradual, smooth boundary.

C—47 to 60 inches +, dark-brown to brown (10YR 4/3) silt loam; a few grayish-brown (10YR 5/2) streaks; massive; friable; a few, soft, small iron concretions; medium acid.

The surface layer ranges from very dark gray to very dark brown in color. In reaction the solum ranges from slightly acid to neutral.

Worthen soils occupy higher areas than the light-colored Wakeland soils and the fine-textured, dark-colored Montgomery and Shiloh soils. They are similar to Drury soils but are darker colored.

Worthen silt loam (37).—This is the only Worthen soil mapped in the county. It is nearly level to very gently sloping and is on terraces. The soil occupies somewhat higher areas than Wakeland silt loam, which is somewhat poorly drained.

Included with this soil are small areas of light-colored Drury soils and of light-colored, calcareous Jules silt loam

Also included are small areas of dark-colored, somewhat poorly drained soils, which may require some drainage.

Worthen silt loam is well suited to all crops commonly grown in the county. It generally can be cropped intensively, though the very gently sloping areas are subject to slight erosion. Lime, phosphorus, potassium, and nitrogen should be applied as needed. Management group I–1; not assigned to a woodland suitability group.

Wynoose Series

Soils of the Wynoose series are nearly level, light colored, and poorly drained. These soils have a claypan. They are in nearly level to depressional areas in uplands in the northwestern part of the county. Wynoose soils formed in windblown silty material, or loess, 20 to 50 inches thick over weathered clay loam to loamy glacial drift of Illinoian age. The vegetation was a forest consisting of post oak, blackjack oak, and hickory.

In most places the surface layer is dark grayish-brown to grayish-brown, friable silt loam about 8 inches thick. Just below is gray and light-gray to gray silt loam, also about 8 inches thick. The subsoil, a mottled gray heavy silty clay loam to silty clay, is about 23 inches thick.

These soils have high available moisture capacity and are very slowly permeable. They generally are very strongly acid, are very low in available phosphorus, and are low in available potassium. Growth of plant roots and movement of water into and through the soil are somewhat restricted by the claypan that makes up the subsoil.

Representative profile of Wynoose silt loam on a slope of 0 to 2 percent, 50 feet east of a dirt road (NW1, SE 10, NE40, SW160, sec. 20, T. 7 S., R. 8 E.):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) to grayish-brown (10YR 5/2) silt loam; weak, fine and medium, granular structure; friable; common black (10YR 2/1) iron concretions; abundant roots; medium acid; abrupt, smooth boundary.

A21—8 to 11 inches, gray (10YR 6/1) silt loam; a few, medium, distinct, brownish-yellow (10YR 6/6) mottles; weak, thin and medium, platy structure; very friable; vesicular; a few roots; very strongly acid; clear, smooth boundary.

A22—11 to 16 inches, light-gray (10YR 7/1) to gray (10YR 6/1) silt loam; a few, fine, faint, light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) mottles; weak, fine and very fine, granular structure; very friable; vesicular; a few roots; very strongly acid; abrupt, smooth boundary.

B21t—16 to 23 inches, gray (10YR 5/1) heavy silty clay loam; a few, medium, faint, yellowish-brown (10YR 5/8) mottles and a few, fine, faint, light-gray (10YR 7/1) silt streaks and pockets; moderate, fine, prismatic structure; firm; gray (2.5Y to 10YR 6/1) silt coatings on peds; common roots; very strongly acid; clear, smooth boundary.

B22t—23 to 29 inches, gray (10YR 5/1) silty clay; many, fine, distinct, yellowish-brown (10YR 5/8) mottles and a few, fine, faint, light-gray silt coats; moderate to strong, fine and medium, prismatic structure that breaks to moderate, medium, subangular blocky; very firm; continuous gray (10YR to 2.5Y 6/1) clay coatings; common roots; very strongly acid; clear, smooth boundary.

B23t—29 to 34 inches, mixed gray (10YR 5/1) and brown (10YR 5/3) silty clay loam; weak, coarse, subangular blocky structure; firm; light brownish-gray (2.5Y 6/2) clay coatings; a few roots; very strongly acid; clear, smooth boundary.

IIB3—34 to 39 inches, mixed gray (10YR 6/1), light brownish-gray (2.5Y 6/2), and pale-brown (10YR 6/3) light silty clay loam that feels gritty; weak, coarse, subangular blocky structure; firm; a few, small, gray (10YR 6/1) silt pockets; very strongly acid; clear, smooth boundary.

IIC—39 to 50 inches +, mixed gray (10YR 6/1), light brownish-gray (2.5Y 6/2), and pale-brown (10YR 6/3) silt loam that feels gritty; massive; friable to firm; very strongly acid.

The surface layer and the subsurface layer combined range from 14 inches to 24 inches in thickness. In color the subsurface layer generally is gray to light gray faintly mottled with brownish yellow and pale brown, but in some places this layer lacks such mottles. Reaction ranges from strongly acid to very strongly acid.

Wynoose soils are similar to Weir soils, but they formed in shallower deposits of silty material, are more strongly weathered, and unlike them, have a more well developed claypan. They also are similar to Racoon soils, but their surface layer and subsurface layer combined are less thick.

Wynoose and Weir silt loams (12).—This undifferentiated unit is the only unit in which the Wynoose soils were mapped in this county. It consists of nearly level Wynoose and Weir silt loams. The areas are in the northwestern part of the county and are commonly known as "post oak flats." In most places the Wynoose and Weir soils occupy nearly level to depressional areas above nearby Bluford and Stoy soils, on slopes that break downward.

Included with this soil are small areas of somewhat poorly drained Bluford and Stoy soils.

The main limitations of Wynoose and Weir silt loams are very slow to slow permeability, low fertility, and low content of organic matter. These soils have high available moisture holding capacity, but rooting depth is restricted by the claypan subsoil, where the soils have not been limed and adequately fertilized (*5, 14*). The soils remain wet and cold until late in spring. Drainage is needed, but tile drains are not satisfactory because of the claypan subsoil. The surface layer of the Wynoose soil is very silty and a thick crust forms on the surface after a rain. This crust hinders infiltration of water and keeps seedlings from emerging.

If drainage is provided and if lime, phosphorus, potassium, and nitrogen are added, these soils are moderately well suited to the crops commonly grown and can be cropped intensively. Growth of crops is reduced in dry periods, even though these soils have high available moisture holding capacity and use of proper soil treatment increases root depth of the common field crops. Practices needed to increase the intake of water and to keep the soil from crusting are growing grasses and legumes in the cropping system and returning all crop residues to the soils. Management group IIIw–3; woodland suitability group 3.

Zanesville Series

In the Zanesville series are moderately deep, moderately sloping to moderately steep, light-colored soils that are moderately well drained and have a fragipan. These soils are on fairly complex slopes in and around the upper reaches of waterways. The areas are rolling and are in the southern part of the county. Zanesville soils formed under oak and hickory trees in windblown silty material, or loess, less than 40 inches thick over sandstone bedrock or material weathered from sandstone.

The surface layer generally is mixed dark grayish-brown and brown, granular silt loam in the upper part and brown, granular silt loam in the lower part. It is about 13 inches thick. The subsoil is strong-brown light silty clay loam that has blocky structure. Depth to the fragipan is about 26 inches.

These soils have moderate water-holding capacity. Permeability is moderate in the layers above the fragipan and very slow in the fragipan. Zanesville soils generally are very strongly acid, are low in available phosphorus, and are medium to high in available potassium.

Representative profile of a Zanesville silt loam on a slope of about 19 percent, 600 feet south of the culvert on the east side of the road (NW40, SE160, sec. 22, T. 10 S., R. 8 E.):

A1—0 to 4 inches, mixed dark grayish-brown (10YR 4/2) and brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable; extremely acid; abrupt, smooth boundary.

A2—4 to 13 inches, brown (7.5YR 4/4) silt loam; a few, fine, faint strong-brown (7.5YR 5/6) mottles; dark-brown (7.5YR 4/4) coats on root channels; weak, medium, granular structure; friable; extremely acid; clear, wavy boundary.

B21t—13 to 22 inches, strong-brown (7.5YR 5/6) light silty clay loam; some, discontinuous, dark-brown (7.5YR 4/4) clay films; weak, medium and coarse, subangular blocky structure; friable; small sandstone fragments; a few iron and manganese concretions; very strongly acid; clear, wavy boundary.

B22t—22 to 26 inches, strong-brown (7.5YR 5/6) light silty clay loam; a few, discontinuous, reddish-brown (5YR 4/4) clay films; a few, fine, black (N 2/0) iron concretions; moderate, medium, subangular blocky structure; firm; very strongly acid; clear, wavy boundary.

IIBx1—26 to 33 inches, brown (10YR 5/3) heavy silt loam that is noticeably gritty; a few, fine, distinct, brown to dark-brown (7.5YR 4/4) mottles and a few, fine, faint, yellowish-brown (10YR 5/6) mottles; some patchy, black (N 2/0) iron stains; a few, discontinuous, reddish-brown to yellowish-red (5YR 4/6) clay films; some silt coatings that are white (10YR 8/1) when dry but are light gray (10YR 7/2) to light brownish gray (10YR 6/2) when moist; very weak, coarse, subangular blocky structure to structureless; very firm, but friable when crushed; a few black (N 2/0) iron concretions; some dark-brown (7.5YR 4/4) clay in root channels; very strongly acid; abrupt, irregular boundary.

IIBx2—33 to 37 inches, brown (10YR 5/3) loam; a few, fine, distinct dark-brown (7.5YR 4/4) mottles and a few, fine, faint, yellowish-brown (10YR 5/6) mottles; some patchy, black (N 2/0) iron stains; some silt coatings that are white (10YR 8/1) when dry and are light gray (10YR 7/2) to light brownish gray (10YR 6/2) when moist; the gray colors are about 25 percent of the horizon; structureless; very strongly acid; this horizon appears to be more porous than the IIBx1 horizon.

R—37 inches, sandstone bedrock.

In texture the surface layer generally is silt loam, but in severely eroded areas it is silty clay loam. Thickness of the surface layer ranges from less than 1 inch to 14 inches. In the less sloping areas the fragipan has a distinct gray layer covering the brown fragipan, but in the more sloping and relatively narrow areas the gray layer is lacking.

Zanesville soils are similar to the Hosmer soils but formed in thinner deposits of loess. They also are like the Wellston soils, but those soils lack a fragipan.

Zanesville silt loam, 3 to 12 percent slopes, eroded (340D2).—This soil occupies long narrow areas. Some of the areas are on ridges surrounded by Wellston-Berks complex, 12 to 60 percent slopes, eroded. Other areas are between areas of Wellston-Berks complex, 12 to 60 percent slopes, eroded, and areas of nearly level Wakeland silt loam.

Part of the original surface layer has been removed through erosion. The present surface layer is brown to strong brown in color and is less than 7 inches thick. It contains less organic matter than the original one and is in poorer tilth. As a result erosion and runoff are greater and less water moves into the soil and is held available for crops.

Included with this soil are small areas of Hosmer soils, which are deeper to sandstone material than this soil. Also included are some areas of other Zanesville soils. Other included areas consist of soils that are severely eroded and have less than 3 inches of their original surface soil remaining.

The main limitations of this Zanesville soil are slopes, hazard of further erosion, slow movement of water in the fragipan, and moderate water-holding capacity. If erosion is controlled, loss of water reduced, and tilth improved, the soil is moderately well suited to the common grain crops and is moderately well suited to well suited to hay and pasture. Practices needed are growing grasses and legumes in the cropping system most of the time, returning all crop residues to the soil, and keeping tillage to a minimum. Such practices as farming on the contour and installing terraces and diversions for control of erosion are difficult to apply because of the irregular slopes. Grass waterways are difficult to establish in places because of exposed sandstone bedrock in the bottom of the waterways. Management group IVe-4; woodland suitability group 4.

Zanesville silt loam, 12 to 18 percent slopes, eroded (340E2).—In some places this soil is in waterways. In other places the soil occupies long, narrow areas between nearly level, somewhat poorly drained Wakeland silt loam and Hosmer soils, which are in the uplands and are deeper to sandstone material than this soil.

Much of the original surface layer of this soil has been removed through erosion. The present surface layer contains less organic matter than the original one and is in poorer tilth. As a result erosion and runoff are greater and less water moves into the soil and is held available for crops.

The main limitations of this soil are slopes, hazard of further erosion, and slow movement of water in the fragipan. The areas are better suited to pasture or woodland than to other uses. Applying lime and fertilizer and leaving the areas in trees and pasture are ways of controlling erosion. Management group VIe-2; woodland suitability group 4.

Zanesville soils, 12 to 18 percent slopes, severely eroded (340E3).—This soil occupies narrow irregular areas. The areas are above moderately sloping Hosmer soils, which are deeper to sandstone material than this soil, and above nearly level Wakeland silt loam, which is somewhat poorly drained.

The surface layer is strong brown in color, ranges from silt loam to light silty clay loam in texture, and is less than 3 inches thick. It contains more clay than that in the profile described for the series. The fragipan is thinner than in less sloping Zanesville soils. It is about 8 inches thick. Depth to sandstone material is about 24 inches.

Included with this soil are small areas of other Zanesville soils. Also included are some areas of Hosmer soils, which are deeper to sandstone material than this soil, and some areas of Wellston soils, which have no fragipan.

The main limitations of this Zanesville soil are slopes, hazard of further erosion, and very slow permeability in the fragipan. All of this soil has been farmed at some time. Most areas are now idle and have a cover of shrubs and scrub trees. The soil is better suited to trees and recreational purposes than to other uses. Replanting the areas to desirable trees is a way to help control erosion. Management group VIIe–1; woodland suitability group 4.

Zanesville silt loam, 18 to 30 percent slopes, eroded (340F2).—This soil occupies narrow irregular areas. The areas are above moderately sloping Hosmer soils, which are deeper to sandstone material than this soil, and above nearly level Wakeland silt loam, which is somewhat poorly drained.

The fragipan is thinner in this soil than in less sloping Zanesville soils. It is about 6 inches thick. Depth to sandstone material is about 20 inches.

Included with this soil are small areas of other Zanesville soils, and of Wellston soils, which have no fragipan. Also included are some severely eroded soils that have less than 3 inches of the original surface soil remaining. In other included areas, gullies have cut down to sandstone bedrock.

The main limitations of this Zanesville soil are steep slopes, hazard of further erosion, and very slow movement of water in the fragipan. Most areas are in trees, and the soil is better suited to trees and to recreational purposes than to other uses. Management group VIIe–1; woodland suitability group 4.

Use and Management of the Soils

This section briefly describes the system of capability classification used by the Soil Conservation Service, and then discusses the management of the soils by groups. Next, general management of cultivated soils is suggested, and predicted yields of the principal crops are given for each soil. Also discussed in this section are suitability of the soils for woodland and for recreation and use of the soils for engineering.

Capability Groups of Soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The classification does not apply to horticultural crops, or to rice and other crops having special requirements. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; and without consideration of possible but unlikely major reclamation projects.

In the capability system, all kinds of soils are grouped at three levels, the capability class, subclass, and unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest grouping, 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 some limitations that reduce the choice of plants or require moderate conservation practices.

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

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

Class V soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to grazing, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes. (None in Gallatin County.)

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 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 Gallatin 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 contain, at the most, only subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

MANAGEMENT GROUPS are soil groups within the subclasses. The soils in one management group 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 management group is a convenient grouping for making many statements about management of soils. Management groups are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-2. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation, as defined in the foregoing paragraph. The Arabic numeral specifically identifies the management group within each subclass.

Management by Groups of Soils

In the following pages the management groups in Gallatin County are described and suggestions for use and management for all the soils of that group are given. The names of soil series represented are mentioned in the description of each management group, but this does not mean that all soils of a given series appear in the unit. To find the names of all the soils in any given management group, refer to the "Guide to Mapping Units" at the back of this survey.

Management group I–1

This group consists of deep, moderately dark colored to dark colored, somewhat poorly drained to well-drained soils of the Harco, Marissa, Plano, and Worthen series. These soils are nearly level to very gently sloping and are on terraces. They have a surface layer of silt loam. Their subsoil is silty clay loam or heavy silt loam. Permeability is moderate to moderately slow, and available moisture capacity is high or very high.

These soils are suited to all crops commonly grown in the county. They can be cropped intensively under good management. Good management includes keeping tillage to a minimum, returning all crop residues to the soils, and adding fertilizer in the amounts required.

The soils in this group are medium acid to neutral and are medium to high in available phosphorus and potassium. Corn and small grains respond well if supplemental nitrogen is applied.

In some areas of the Marissa soil, drainage is slightly impaired. Here tile can be used to improve drainage. The other soils in this group do not require drainage.

Soils in this group generally are used for cash grain crops. Hay and pasture crops seldom are grown, though the soils are suitable for such use.

Management group I–2

In this group are deep, light-colored, well-drained soils of the Camden, Drury, Haymond, Jules, and Uniontown series. Most of these soils are nearly level, but the Haymond soil is nearly level to gently sloping. These soils are on terraces and bottom lands. Their surface layer is silt loam, and their subsoil is silt loam or silty clay loam. Permeability is moderate to moderately slow, and available moisture capacity is high.

Under good management these soils are suited to all crops commonly grown in the county and can be cultivated intensively. Good management includes keeping tillage to a minimum, returning all crop residues to the soils, and adding fertilizer in the amounts required. These practices help to keep a crust from forming on the surface.

The soils in this group are very strongly acid to calcareous, are low to medium in available phosphorus, and are medium in potassium. The content of organic matter is low. Fertility varies. The response of crops to fertilizer is good. The Jules soil is calcareous and generally does not need lime. Also because of its high content of lime, rock phosphate is not suitable for use on the Jules soil.

These soils generally are used for cash grain crops. Hay and pasture crops seldom are grown, though the soils are suitable for such use.

Management group IIe–1

In this group are deep, nearly level to gently sloping, light- and dark-colored, well-drained soils of the Drury and Plano series. These soils are on terraces. Their surface layer is silt loam, and their subsoil is silt loam or silty clay loam. Permeability is moderate, and available moisture capacity is high. The hazard of erosion is moderate.

These soils are suited to all crops commonly grown in the county if erosion is controlled. Returning all crop residues to the soils, farming on the contour, or growing cover crops in winter are ways of controlling erosion. Tillage also must be kept at a minimum, and fertilizer applied in the amounts required. Crops can be grown continuously only if farming is done on the contour. If contour farming is not used, cover crops are grown in winter or the cropping system includes grasses and legumes 1 year out of 6.

The soils in this group are medium acid to neutral and are medium to high in available phosphorus and potassium. The response of crops to fertilizer is good.

These soils generally are used for cash grain crops. Hay and pasture crops seldom are grown, though the soils are suitable for such use.

Management group IIe–2

This group consists of deep, light-colored to moderately dark colored, moderately well drained to well drained soils of the Alford, Camden, Emma, Hickory, and Uniontown series. These soils are very gently sloping to gently sloping and are on terraces or are in the uplands. The Emma soil has a surface layer of silty clay loam, but the surface layer of the other soils is silt loam. All of these soils are subject to erosion, and some of them are moderately eroded. The eroded soils have only from 3 to 7 inches of their original surface soil remaining.

If erosion is controlled, these soils are well suited to moderately well suited to all crops commonly grown in the county and can be cropped moderately intensively. Growing grasses and legumes in the cropping system, returning all crop residues to the soils, farming on the contour, and terracing are ways of controlling erosion. Tillage also must be kept to a minimum and lime and fertilizer applied in the amounts required. Crops can be grown continuously only if terracing is done and if cover crops are grown in winter.

The soils in this group are very strongly acid to medium acid, are low in available phosphorus, and are low to high in available potassium. Fertility varies. The response of crops to fertilizer is good.

The trees have been cleared from most areas of these soils, and much of the acreage is used for cash grain crops. Hay and pasture crops are grown occasionally, and the soils are well suited to this use.

Management group IIe–3

Light-colored, moderately well drained soils of the Ava, Hosmer, and Sciotoville series are in this group. These soils commonly have a fragipan at a depth of 25 to 30 inches. They are very gently sloping and are on terraces or are in the uplands. They have a surface layer of silt loam and a subsoil of silty clay loam. All of these soils are subject to erosion. Fertility also is a problem.

If erosion is controlled, these soils are moderately well suited to all crops commonly grown in the county and can be cropped moderately intensively. Growing grasses and legumes in the cropping system, returning all crop residues to the soils, and applying lime and fertilizer are ways of controlling erosion. Tillage also must be kept to a minimum. The irregular size and shape of the areas make farming on the contour and installing terraces difficult.

The soils in this group are strongly acid to very strongly acid. They are low in available phosphorus and are medium in available potassium. The response of crops to lime and fertilizer is good.

The trees have been cleared from most areas of these soils, and most areas are used for cash grain crops. Hay and pasture crops seldom are grown, though the soils are suitable for such use.

Management group IIe–4

This group consists of light-colored and dark-colored, somewhat poorly drained to well-drained soils of the Alvin, Onarga, and Roby series. They are deep or moderately deep to loose sandy material. These soils are nearly level to gently sloping and are on terraces. They have a surface layer of fine sandy loam and a subsoil of sandy loam to clay loam. Permeability is moderate to moderately rapid, and available moisture capacity is moderate. The soils are subject to wind and water erosion and are somewhat droughty. They are easy to till.

If erosion is controlled and if the moisture-holding capacity is increased, these soils are moderately well suited to well suited to the crops commonly grown in the county. The soils can be cropped moderately intensively. Growing grasses and legumes in the cropping system, returning all crop residues to the soils, and applying lime and fertilizer are ways of controlling erosion. Tillage also must be kept to a minimum. The irregular size and shape of the areas make farming on the contour and installing terraces difficult.

The soils in this group generally are slightly acid to strongly acid, but they are neutral in some places. They are low in available phosphorus and are low to medium in available potassium. The response of crops to fertilizer is good. The need for lime varies widely.

Most areas of these soils have been cleared of trees, and much of the acreage is used for grain crops. Hay and pasture crops are grown in some places. The areas generally are not used as woodland.

Management group IIw–1

Deep, light-colored or moderately dark colored, moderately well drained soils of the Emma and Sciotoville series are in this group. These soils are nearly level and are on terraces. The surface layer of the Emma soil is silty clay loam, and that of the Sciotoville soil is silt loam. In both soils the subsoil is silty clay loam. The Sciotoville soil has a weakly developed fragipan. Permeability is moderately slow to slow, and available moisture capacity is moderate to high. Water stands on the surface of these soils during rainy periods.

These soils are moderately well suited to well suited to all crops commonly grown in the county. They can be cropped intensively under good management. Good management includes keeping tillage to a minimum, returning all crop residues to the soils, and adding fertilizer. Surface drains can be used to remove excess water; tile drains are not suitable.

The soils in this group are very strongly acid. They are low in available phosphorus and medium in available potassium. Crops on these soils respond well if fertilizer is applied.

Soils in this group generally are used for cash grain crops. Hay and pasture crops seldom are grown, though the soils are suitable for such use.

Management group IIw–2

This group consists of deep, light-colored, somewhat poorly drained soils of the Iva, Reesville, and Starks series. These soils are nearly level to gently sloping and are on terraces or are in the uplands. The surface layer is silt loam, and the subsoil is silty clay loam. All but 3 to 7 inches of the original surface layer of Reesville silt loam, 2 to 4 percent slopes, eroded, has been removed through erosion. Permeability of the soils in this group is moderate to moderately slow. Available moisture capacity is moderate to high. Water stands on the surface for short periods during part of the year, and tilth and fertility are also problems.

These soils are moderately well suited to well suited to the crops commonly grown in the county. They can be cropped intensively if practices are used to improve tilth and fertility and if drainage is provided. Practices needed are adding lime and fertilizer as required, returning all crop residues to the soils, and keeping tillage to a minimum. Tile drains can be used to remove excess surface water. Care is needed, however, because fine sand is at a depth of less than 40 inches in the Starks soils and sand pockets occur in the Reesville soils in a few places.

A crust forms on Reesville silt loam, 2 to 4 percent slopes, eroded, after a rain. This crust reduces water intake and water-holding capacity of the soil and thus increases losses of soil and water.

The soils in this group are slightly acid to very strongly acid. They are low in available phosphorus and medium in available potassium. The response of crops to fertilizer is good.

The trees have been cleared from all areas of these soils, and the areas are now used for row crops. Hay and pasture crops seldom are grown, though the soils are well suited to such use.

Management group IIw–3

Deep, light-colored, somewhat poorly drained soils of the Bluford, Creal, Stoy, and Weinbach series are in this group. These soils are nearly level to gently sloping and are on terraces or are in the uplands. The surface layer is silt loam, and the subsoil is silty clay loam. Permeability is slow, and available moisture capacity is high. Water stands on the surface of these soils for short periods during part of the year. Erosion is a hazard on the gently sloping areas, and tilth and fertility are additional problems.

These soils are moderately well suited to well suited to the crops commonly grown in the county. They can be cropped moderately intensively if erosion is controlled, if drainage is provided, and if tilth and fertility are improved. Growing grasses and legumes in the cropping system, returning all crop residues to the soils, keeping tillage to a minimum, and adding lime and fertilizer are ways of controlling erosion. Farming on the contour and terracing also help to control erosion, but if used, ways must be provided to remove the excess water that is likely to accumulate on the surface. Surface drains can be used to remove excess water, but tile drains generally are not suitable for such use.

The soils in this group are strongly acid to very strongly acid. They are low to very low in available phosphorus and are low to medium in available potassium. The response of crops to lime and fertilizer is good.

These soils commonly are used for general farming. Trees grow well on these soils and a few areas are still wooded, though these wooded areas are now being cleared.

Management group IIw-4

In this group are deep, light-colored, somewhat poorly drained soils of the Belknap, Dupo, and Wakeland series. These soils are nearly level and are on bottom lands. Their surface layer and subsoil consist of silt loam. Permeability is moderate to moderately slow, and available moisture capacity is moderate or high. Water stands on the surface of these soils for part of the year. Flooding is a slight hazard, and tilth and fertility are minor problems.

These soils can be cropped continuously, and all the common crops can be grown. Tillage must be kept to a minimum, all crop residues must be returned to the soils, and lime and fertilizer should be applied. These practices improve tilth and fertility. Drainage also is needed. It can be provided by using a combination of tile and surface drains. Under good management tile drains alone can be used. Flooding generally occurs only in spring, and the water recedes shortly.

The soils in this group are strongly acid to mildly alkaline. They are low to medium in available phosphorus and potassium. Crops on the soils respond well if fertilizer is applied. The need for lime varies.

Soils in this group generally are used for cash grain crops. Hay and pasture crops seldom are grown, though the soils are suitable for such use. Most areas are cleared of trees, but trees are scattered along the banks of streams and in isolated areas. Tree growth generally is good.

Management group IIw-5

This group consists of deep, dark-colored, poorly drained or very poorly drained Harpster and Patton soils. These soils are nearly level and are on terraces. Their surface layer and subsoil consist of silty clay loam. Permeability is moderate to moderately slow, and available moisture capacity is high or very high. The soils are wet.

These soils can be cropped intensively, and all the common crops can be grown. Practices needed are keeping tillage to a minimum, returning all crop residues to the soils, and applying lime and fertilizer. These practices improve tilth and fertility. Drainage also is needed, and tile drains work well.

The soils in this group are neutral to calcareous, are low in available phosphorus, and are low to high in available potassium. Corn and small grains respond well if supplemental nitrogen is applied. Because of the high content of lime, rock phosphate is not suitable for use on these soils. More readily available forms of phosphate should be used.

Soils in this group are used mostly for cash grain crops. Hay and pasture crops seldom are grown, though the soils are well suited to such use.

Management group IIw-6

In this group are deep, light-colored to dark-colored, very poorly drained to well-drained soils of the Allison, Beaucoup, Petrolia, Sawmill, and Tice series. These soils are on bottom lands. The Allison soil is nearly level to gently sloping, but the other soils are nearly level. In all of the soils, the surface layer and subsoil are silty clay loam. Permeability is moderate to moderately slow, and available moisture capacity is high or very high. Flooding from the Ohio and Wabash Rivers is the chief hazard.

These soils can be cropped intensively if fertilizer is added in the required amounts and if tillage is kept to a minimum and all crop residues are returned to the soils. Because flooding occurs early in spring, the soils are better suited to summer crops, such as corn and soybeans, than to other crops. A plowpan is likely to form in these soils if plowing is done when the soils are wet. Plowing is best done in fall. All crop residues must be plowed under, for the floodwater is likely to float the residues away. The Beaucoup, Petrolia, and Sawmill soils are poorly drained or very poorly drained and need drainage. Tile can be used to provide drainage, but outlets are difficult to obtain in places and are hard to maintain.

These soils are medium acid to neutral, are low to high in available phosphorus, and are medium to high in available potassium. Corn responds well if supplemental nitrogen is applied.

Serious infestation by johnsongrass and wild cane has resulted because of flooding. Up-to-date methods are needed for control of these weeds, and the local farm adviser should be consulted.

Most areas of these soils have been cleared. Only small areas in sloughs and in isolated plots are wooded. Corn and soybeans are the main crops. Hay and pasture crops seldom are grown because of the flooding hazard.

Management group IIw-7

This group consists of deep, moderately dark colored to dark colored, poorly drained soils of the Montgomery and Shiloh series. These soils are nearly level and are on terraces. The surface layer is silty clay, except in Montgomery silt loam, overwash. The subsoil also is silty clay. Permeability is slow to moderately slow, and available moisture capacity is high. These soils are wet.

The soils in this group can be cultivated moderately intensively, and all of the common crops can be grown. Drainage is needed, and a combination of tile and surface drains can be used to provide drainage. Tile alone can be used under good management, but it drains the soil slowly. Tilth can be improved if tillage is kept to a minimum, all crop residues are returned to the soils, and fertilizer is added. In addition grasses and legumes should be included in the cropping system for 1 year out of 4.

Except for Montgomery silt loam, overwash, which is strongly acid to neutral, these soils are slightly acid to neutral. All of the soils are low in available phosphorus. They are low to high in available potassium. Because of the high lime content, rock phosphate is not suitable for use on these soils. More readily available forms of phosphate should be used.

Trees have been cleared from most areas of these soils. The areas are used occasionally for hay and pasture. Hay grows well, but some areas may be too wet in spring and fall for good growth of pasture plants.

Management group IIs–1

In this group are light-colored, somewhat poorly drained to well-drained soils of the Alvin and Roby series. They are deep or moderately deep to loose sandy material. These soils are nearly level and are on terraces. Their surface layer is fine sandy loam, and their subsoil is sandy loam to clay loam. Permeability is moderate to moderately rapid. Available moisture capacity is moderate, and the soils are somewhat droughty. These soils are easy to till.

If practices are used to conserve moisture, and if management otherwise is good, these soils can be cropped continuously. All of the common cultivated crops grow well, and hay and pasture crops also grow well. Practices needed are keeping tillage to a minimum, returning all crop residues to the soils, and adding lime and fertilizer.

The soils in this group generally are strongly acid to slightly acid but are neutral in some places. They are low in available phosphorus and potassium. The response of crops to fertilizer is good. The need for lime varies widely.

Most areas of these soils have been cleared of trees. The soils are used chiefly for cash grain crops, though hay and pasture crops also are grown. The areas generally are not used as woodland.

Management group IIs–2

Burnside silt loam is the only soil in this group. It is moderately deep to shallow, is light colored, and is moderately well drained. This soil occupies narrow, nearly level to gently sloping areas on bottom lands. The surface layer is silt loam. It is underlain by channery rock and other rock fragments at a depth of less than 30 inches. Permeability and available moisture capacity are moderate. The soil is somewhat droughty and is also subject to occasional flooding.

If practices are used that improve the moisture-supplying capacity, and if management otherwise is good, this soil can be cropped continuously. All of the common cultivated crops grow moderately well to well. Hay and pasture crops grow well under good management. Practices needed are keeping tillage to a minimum, returning all crop residues to the soils, and adding lime and fertilizer. Flooding is a slight hazard and does not limit the choice of crops. The floodwater stays on the soils for only a short period. It leaves a silty deposit on plants, however, which affects the quality of hay grown and impairs the palatability of pasture.

The soil in this group is medium acid to strongly acid and is low in available phosphorus and potassium. All crops on this soil respond if lime and fertilizer are added.

Some areas of this soil are used for grain and others are used for hay and pasture. The trees in the remaining wooded areas are oak, hickory, and ash. Tree growth is good.

Management group IIIe–1

This group consists of deep, light-colored, gently sloping to moderately sloping, well-drained soils on terraces. These soils are in the Lamont series. Their surface layer is fine sandy loam to loamy sand, and their subsoil is fine sandy loam. These soils are subject to wind and water erosion, and in some places less than 7 inches of the original surface layer remains. Permeability is moderately rapid, water-holding capacity is low, and the soils are droughty.

If erosion is controlled, these soils are well suited to hay and pasture crops and to watermelons, a special crop in the county. Growth of the common cultivated crops is fair to moderate. Ways of controlling erosion are growing grasses and legumes in the cropping system, in combination with contour farming and terracing, and returning all crop residues to the soils. Tillage also must be kept to a minimum and fertilizer applied.

These soils are medium acid to mildly alkaline and are low in available phosphorus and potassium. Because they are sandy, leaching of plant nutrients and lime is rapid. Fertilizer therefore must be added frequently. The response of crops to fertilizer is good.

The trees have been cleared from most areas of these soils, and much of the acreage is now used for pasture and hay crops. Some areas that have been poorly managed are now idle and have a cover of broomsedge and briers.

Management group IIIe–2

In this group are light-colored or dark-colored, well drained or moderately well drained soils of the Alvin and the Onarga series. These soils are deep to moderately deep over sand. They are gently sloping and are on terraces. Their surface layer is fine sandy loam, and their subsoil is sandy clay loam. The Alvin soil is eroded, and less than 7 inches of its original surface layer remains. Permeability of both soils is moderate or is moderately rapid. Available water holding capacity is moderate. Erosion is the chief hazard.

If erosion is controlled and if practices are applied that provide for most efficient use of the moderate amount of water available, these soils are well suited to the cultivated crops commonly grown and to the common hay and pasture crops. They also are suited to watermelons, a special crop in the county. Practices needed are using a suitable cropping system, in combination with contour farming and terracing, and returning all crop residues to the soils. Tillage also must be kept to a minimum and lime and fertilizer applied.

These soils are strongly acid to neutral, are low in available phosphorus, and are low to medium in available potassium. The response of crops to fertilizer is good.

Soils in this group are used for general farming. Few trees remain on the areas.

Management group IIIe-3

This group consists of deep, light-colored, well-drained soils of the Alford, Bold, Camden, and Uniontown series and somewhat poorly drained soils of the Reesville series. These soils are gently sloping to moderately sloping and are on terraces or are in the uplands. They are moderately eroded or are severely eroded. The surface layer is silt loam, except in severely eroded areas where clayey material from the subsoil has been mixed with the remaining surface soil. The subsoil is silty clay loam. Erosion is the chief hazard, but fertility also is a problem.

If erosion is controlled and fertility is improved, these soils are well suited to the crops commonly grown and also are well suited to hay and pasture. Practices needed are growing grasses and legumes in the cropping system, in combination with contour farming and terracing, and returning all crop residues to the soils. Tillage also must be kept to a minimum and lime and fertilizer applied.

These soils are strongly acid to slightly acid, are low in available phosphorus, and are medium to high in available potassium. The response of crops to fertilizer is good. The need for lime varies.

In this group, the soils on terraces are used for grain and those in the uplands are used for hay and pasture. Trees have been cleared from most areas, though trees grow very well on these soils.

Management group IIIe-4

This group consists of deep, light-colored, moderately well drained to well drained soils of the Markland series. These soils are nearly level to gently sloping and are on terraces. They are severely eroded or are moderately eroded. The surface layer is silt loam, and the subsoil is silty clay. Permeability is slow to very slow, and available moisture holding capacity is moderate. Erosion is the chief hazard, though tilth, fertility, and moisture-supplying capacity also are problems. In addition a crust forms on the surface of these soils after a rain.

Under good management these soils are moderately well suited to the common cultivated crops and grain crops and are well suited to hay and pasture. Growing grasses and legumes in the cropping system, returning all crop residues to the soils, keeping tillage to a minimum, and adding lime and fertilizer are ways of controlling erosion. These practices also help to improve tilth, to increase the supply of moisture, and to reduce crusting. Farming on the contour and terracing also help in the control of erosion, but these practices are difficult to apply because of the size and shape of the areas.

These soils are strongly acid to very strongly acid. They are low in available phosphorus and are medium in available potassium. The response of crops to lime and fertilizer is good.

All areas of these soils are cleared of trees and have been cropped at some time. Some areas that have been poorly managed are now idle.

Management group IIIe-5

Light-colored, moderately well drained soils of the Ava, Hosmer, and Sciotoville series are in this group. They have a fragipan, commonly at a depth of 25 to 30 inches. These soils are gently sloping to moderately sloping and are on terraces or are in the uplands. The surface layer is silt loam, and the subsoil is silty clay loam. These soils are slightly eroded or are moderately eroded. The fragipan restricts development of roots and movement of water through the soils. Permeability is moderately slow to slow, and water-holding capacity is moderate. Erosion is the chief hazard, though tilth, fertility, and water-holding capacity also are problems. In addition the surface crusts readily.

Under good management these soils are moderately well suited to the common cultivated crops and grain crops and are well suited to hay and pasture. Growing grasses and legumes in the cropping system, returning all crop residues to the soils, and adding lime and fertilizer are ways of controlling erosion. These practices also help to improve tilth, to increase the supply of moisture, and to reduce crusting. Farming on the contour and terracing also help in the control of erosion, but these practices are difficult to apply because of the size and shape of the areas.

These soils are strongly acid to very strongly acid. They are low in available phosphorus and are medium in available potassium. The response of crops to lime and fertilizer is good.

All of the hardwoods have been cleared from areas of these soils, and some areas within the Shawnee National Forest have been planted to pines. Some areas of these soils that have been poorly managed are now idle.

Management group IIIe-6

This group consists of deep light-colored, somewhat poorly drained soils of the Bluford and McGary series. These soils are gently sloping and are on terraces or are in the uplands. Their surface layer is silt loam, and their subsoil generally is silty clay loam to silty clay. These soils are eroded. Permeability is slow to very slow, and available moisture capacity is high. Erosion is the chief hazard, but tilth, fertility, and wetness also are problems. In addition the surface crusts readily after a rain.

If erosion is controlled, tilth is improved, and permeability is increased, these soils are moderately well suited to the common cultivated crops and grain crops. They also are well suited to hay and pasture. Practices needed are growing grasses and legumes in the cropping system, returning all crop residues to the soils, keeping tillage to a minimum, and applying lime and fertilizer. Farming on the contour and terracing also help in the control of erosion, but these practices are difficult to apply because of the irregular size and shape of the areas. Row crops should not be grown on the McGary soil because of the severe erosion hazard.

These soils are strongly acid to very strongly acid. They are low to very low in available phosphorus and are low to high in available potassium. The response to lime and fertilizer, including nitrogen fertilizer, is good.

All of the soils in this group have been cleared and farmed at some time. Much of the acreage is now used for hay or pasture or is idle. Some small areas are farmed intensively along with other nearby soils.

Management group IIIw-1

Ruark fine sandy loam is the only soil in this group. It is light colored and is poorly drained. This soil is nearly level and is on terraces. It consists of fine sandy loam over sandy clay loam to clay loam. Permeability is slow, and water-holding capacity is moderate. Excess water and slow permeability are the main problems, but fertility also is a problem. The soil remains wet and cold until late in spring. It also crusts readily after a rain.

If tilth and fertility are improved and if drainage is provided, this soil is well suited to the grain crops commonly grown and is moderately well suited to hay and pasture. Surface drains can be used to remove excess water, but tile drains are not suitable for such use because of the slow permeability of this soil. Keeping tillage to a minimum, returning all crop residues to the soil, and applying lime and fertilizer are ways of improving tilth and fertility. In addition grasses and legumes that are tolerant of wetness should be grown in the cropping system and cover crops should be kept on the areas in winter.

This soil is medium acid to very strongly acid and is low in available phosphorus and potassium. The response of crops to fertilizer is fair.

Most areas of this soil are in grain or are used for hay and pasture. Only a few small areas of the soil remain in trees.

Management group IIIw-2

This group consists of deep, light-colored, poorly drained soils of the Birds and Bonnie series. These soils are nearly level and are on bottom lands. They have a surface layer of silt loam. Their subsoil also is silt loam and is weakly developed or lacks development. Permeability is slow, and moisture-holding capacity is high. Excess water is the chief problem, but tilth and fertility also are problems. The soils remain waterlogged and cool until late in spring. A thick crust forms after a rain unless management is good.

If drainage is provided and if management otherwise is good, these soils are well suited to the grain crops commonly grown and can be cropped intensively. They also are moderately well suited to hay and pasture, though the quality of the plants may be poor because of occasional flooding. Other practices needed are keeping tillage to a minimum, returning all crop residues to the soils, and applying lime and fertilizer.

These soils are very strongly acid to neutral and generally are low to medium in available phosphorus and potassium. Consequently, the need for lime, phosphorus, and potassium varies. The response of crops to lime and fertilizer, including nitrogen fertilizer, is good.

Most areas of these soils are used for grain. Only some small isolated areas remain in trees.

Management group IIIw-3

In this group are light-colored, poorly drained or somewhat poorly drained soils of the McGary, Okaw, Racoon, Sexton, Weir, and Wynoose series. These soils are nearly level to very gently sloping. The McGary, Okaw, and Sexton soils are on terraces, the Racoon soils are on foot slopes adjacent to the uplands, and the Weir and Wynoose soils are in the uplands. All of the soils have a surface layer of silt loam. Their subsoil is silty clay loam to silty clay. McGary silt loam, 2 to 4 percent slopes, eroded, has less than 7 inches of the original surface layer remaining.

Permeability of the soils in this group ranges from slow to very slow. Available moisture capacity ranges from moderate to high. Excess water is the chief problem, though tilth and fertility also are problems. The soils remain waterlogged and cool until late in spring. A thick crust is likely to form on the surface if the soils are farmed continuously.

If drainage is provided and if tilth and fertility are improved and permeability is increased, these soils are moderately well suited to the grain crops commonly grown and are well suited to hay and pasture. The soils should not be cropped continuously because of the low content of organic matter. Surface ditches can be used to provide drainage. Tile drains are not suitable for this purpose, because of the slow to very slow permeability of the soils. Other practices needed are growing grasses and legumes in the cropping system for 1 year or more, returning all crop residues to the soils, and keeping tillage to a minimum. Lime and fertilizer also must be applied.

Soils in this group are strongly acid to very strongly acid. They are low to very low in available phosphorus and are low to high in available potassium. The response of crops to lime and fertilizer, including nitrogen fertilizer, is fairly good.

Some areas of these soils are used for grain and some are used for hay and pasture. The areas are known locally as "post oak flats," but the trees have been cleared from all but some small areas.

Management group IIIw-4

This group consists of deep, light-colored, very poorly drained soils of the Karnak and Piopolis series. These soils are on bottom lands. They generally are nearly level, but slopes are as much as 12 percent in some areas around sloughs. The Karnak soil generally has a surface layer and subsoil of silty clay. In the Piopolis soil the surface layer and subsoil generally are silty clay loam.

Permeability of the soils in this group is slow to very slow. Available moisture capacity is high. Excess water is the chief problem, though tilth, fertility, and flooding also are problems. These soils remain waterlogged and cool until late in spring. The clayey surface layer makes preparing a seedbed difficult.

Slow permeability, hazard of flooding, and excess surface water make these soils generally better suited to summer crops, such as corn and soybeans, than to other crops. The flooding hazard makes it risky to grow hay and pasture plants, though these grow well. Drainage is needed, and surface ditches can be used to provide drainage. Tile drains are not suitable for this purpose, because of the slow to very slow permeability of the soils. An adequate seedbed can be prepared by plowing in fall, which makes the surface soil mellow. If plowing or cultivating is done when the soils are wet, hard clods form and make further tillage difficult. Practices needed for improving tilth, fertility, and permeability are keeping tillage to a minimum, returning all crop residues to the soils, and adding lime and fertilizer. In addition green-manure crops should be grown 1 year in 4 and then plowed under.

Soils in this group are very strongly acid to neutral. They are low to medium in available phosphorus and potassium. The response of crops to lime and fertilizer is fair to good.

Corn, soybeans, and other summer crops are the chief crops grown on these soils. Some areas of these soils still are in trees, but the trees are rapidly being removed.

Management group IIIw-5

Deep, dark-colored, poorly drained soils of the Darwin and Wabash series are in this group. These soils are nearly level and are on bottom lands. Except for Darwin silt loam, overwash, the surface layer is silty clay. The subsoil is silty clay to clay. Permeability is moderately slow to very slow, and water-holding capacity is moderate to high. Excess water is the chief problem, but tilth and flooding also are problems. These soils remain wet for long periods.

These soils are better suited to summer crops, such as corn and soybeans, than to other crops. Hay and pasture plants also grow well, but the flooding hazard makes it risky to grow them. Drainage is needed. Surface drains generally can be used to provide drainage, though many low spots are difficult to drain. Tile drains are not suitable for draining these soils.

Because these soils are clayey, plowing must be done in fall to obtain an adequate seedbed. All tillage must be done with care, for the soils become cloddy if tilled when wet. Other practices needed for improving tilth, fertility, and permeability are keeping tillage to a minimum, returning all crop residues to the soils, and adding lime and fertilizer. In addition grasses and legumes should be grown in the cropping system and cover crops or catch crops should be kept on the areas.

Except for some areas of Wabash silty clay that are calcareous, these soils are slightly acid to neutral. The soils are medium to high in available phosphorus and potassium. The response of crops to fertilizer is good. Because the soils are high in lime, rock phosphate generally is not suitable for use on these soils, and phosphorus must be applied in a more soluble form.

Infestation by johnsongrass and wild cane is serious. As a result, grain crops have been damaged. Up-to-date methods are needed for control of these weeds, and the local farm adviser should be consulted.

Most areas of these soils are cleared of trees. Corn and soybeans are the chief crops grown. The areas are seldom used for hay or pasture.

Management group IIIs-1

Lamont fine sandy loam, 1 to 4 percent slopes, is the only soil in this group. It is deep, light colored, and well drained. The areas are on terraces or are in the uplands. The surface layer and subsoil consist of fine sandy loam. Permeability is moderately rapid. The available moisture capacity is low, and droughtiness therefore is the chief problem. Wind erosion also is a problem.

This soil is moderately well suited to most cultivated crops commonly grown, and to the common deep-rooted grasses and legumes. It is well suited to watermelons, a special crop in the county, and it is also well suited to hay and pasture. Practices that improve the water-holding capacity of the soil and that help in the control of erosion are growing grasses and legumes in the cropping system, keeping tillage to a minimum, and returning all crop residues to the soil. In addition lime and fertilizer must be applied and cover crops should be kept on the areas in winter.

Lamont fine sandy loam, 1 to 4 percent slopes, is medium acid to mildly alkaline and is low in available phosphorus and potassium. Crops on this soil respond fairly well if fertilizer is applied. Because the soil is sandy, leaching of plant nutrients and lime is rapid. Fertilizer therefore should be added for the immediate crop, rather than in large amounts expected to last for a long period of time.

Most areas of this soil have been cleared of trees. The areas are used for both cultivated crops and for hay and pasture.

Management group IVe-1

This group consists of deep, light-colored, well-drained soils of the Alvin series. These soils are moderately sloping and severely eroded or are strongly sloping and moderately eroded. The areas are on terraces or are in the uplands. The surface layer of these soils is fine sandy loam and sandy loam. Permeability is moderate or moderately rapid and water-holding capacity is moderate. Erosion is the chief problem, but droughtiness and fertility also are problems.

These soils are suited to limited use for small grains and for watermelons, a special crop in the county. Erosion can best be controlled by growing grasses and legumes for hay or pasture in a long rotation with a small grain. Under good management hay and pasture plants grow moderately well to well. Good management consists of planting grasses and legumes adapted to the soils and adding lime and fertilizer.

The soils in this group are strongly acid to slightly acid and are low in available phosphorus and potassium. Crops on these soils respond fairly well if fertilizer is added. Because reaction varies widely, soil tests are needed before applying lime. The soils also are sandy, and leaching of plant nutrients and lime is rapid. Fertilizer therefore should be applied for the immediate crop, rather than in large amounts expected to last for several years.

All areas of these soils have been cleared of trees at some time. Many areas now are idle, however, and have a cover of briers and sprouts. Some areas are in improved pasture, and some other areas are farmed intensively along with other soils close by.

Management group IVe-2

In this group are deep, light-colored, somewhat poorly drained to well-drained soils of the Alford, Camden, Hickory, and Reesville series. The strongly sloping Alford soil is moderately eroded, but all of the other soils are severely eroded. These soils are gently sloping to strongly sloping and are on terraces or are in the uplands. In areas not severely eroded, the surface layer is silty and the subsoil is silt loam to silty clay loam. In severely eroded areas, clayey material formerly in the subsoil has been mixed with the remaining surface layer, and, as a result, the present surface layer is more clayey than the original one. Permeability of these soils is moderate to moderately slow. Water-holding capacity is high. Severe hazard of erosion is the chief problem, but tilth and fertility also are problems.

These soils are well suited to hay and pasture but are only moderately well suited to the common row crops. Use for crops other than hay or pasture is limited. Erosion can best be controlled by growing grasses and legumes for hay and pasture in a long rotation with small grain.

Soils in this group are very strongly acid to slightly acid. They are low in available phosphorus and are low to high in available potassium. Because reaction and availability of phosphorus and potassium vary, soil tests are needed before applying lime and fertilizer. The response of crops to lime and fertilizer is good.

All areas of these soils have been cleared of trees and farmed at some time. Many areas are now idle and have a cover of weeds, briers, and sprouts. Some areas have been well managed and have a good cover of hay or pasture plants. Trees grow well on all of the soils.

Management group IVe-3

Deep, light-colored and moderately dark colored, moderately well drained to well drained soils of the Emma and Markland series are in this group. These soils are gently sloping and severely eroded or are moderately sloping and moderately eroded. The areas are on terraces. The surface layer is silt loam or silty clay loam in the moderately eroded soils and is light silty clay loam in the severely eroded soils. In the Emma soil the subsoil is silty clay loam, but in the Markland soils the subsoil is silty clay or clay. Permeability is slow to very slow, and water-holding capacity is moderate to high. The erosion hazard is severe if these soils are cultivated. Tilth and fertility also are problems.

These soils are only moderately well suited to hay and pasture. Grain crops can be grown only under special management, and even then their growth is poor. Erosion can best be controlled by growing grasses and legumes for hay and pasture in a long rotation with a small grain. The size and shape of the areas make farming on the contour difficult. Practices needed for improving tilth and fertility are adding lime and fertilizer, returning all crop residues to the soils, and keeping tillage to a minimum.

Soils in this group are strongly acid to very strongly acid. They are low in available phosphorus and are medium in available potassium. The response of crops to lime and fertilizer is fair to good.

All of these soils have been cleared of trees and farmed at some time. Most areas now are pastured or are idle, but some areas are farmed along with other soils nearby.

Management group IVe-4

This group consists of moderately deep and deep, light-colored, moderately well drained to well drained soils of the Ava, Hosmer, Sciotoville, Wellston, and Zanesville series. These soils are gently sloping to strongly sloping and are moderately eroded or are severely eroded. The areas are on terraces or are in the uplands. The surface layer generally is silt loam, and the subsoil, silty clay loam. In the severely eroded soils, however, the surface layer is light silty clay loam. Except for the Wellston soil, a moderately to weakly expressed fragipan occurs at a depth of less than 30 inches. In the Wellston soil, sandstone or sandstone fragments are at a depth of less than 30 inches. Permeability ranges from moderate to moderately slow. It is slow or very slow in the fragipan. Erosion is the chief problem, but water-holding capacity and tilth also are problems.

Use of these soils for cultivated crops is limited. Because of the slopes and erosion hazard, the soils probably are better suited to hay and pasture than to other uses (fig. 16). Erosion can be controlled by keeping the areas in hay or pasture in a long rotation with a small grain. Practices needed for improving tilth and fertility are applying lime and fertilizer and keeping tillage to a minimum when necessary to renew the stands of hay and pasture.

These soils are strongly acid to very strongly acid. They are low to very low in available phosphorus and are low to medium in available potassium. The response of crops to lime and fertilizer, including nitrogen, is fair to good.

All of the soils in this group have been cleared of trees and farmed at some time. The soils in the Shawnee National Forest have been replanted to pines, but the soils under private ownership are mostly idle or are in hay and pasture. The only areas still cultivated are small and are farmed along with other soils nearby.

Management group IVs-1

Bloomfield fine sand, 1 to 12 percent slopes, is the only soil in this group. It is deep, light colored, well drained, and gently sloping to sloping. This soil is on terraces or is in the uplands. Its surface layer is fine sand. The subsoil, which is at a depth of more than 40 inches, consists of alternate layers of yellowish-brown loamy sand and thin layers of dark-brown sandy loam enriched with iron and clay. Permeability is rapid, and water-holding capacity is low.

Low moisture-holding capacity, hazard of wind erosion, and low fertility make this soil poorly suited to grain and only moderately well suited to hay and pasture. Under good management the supply of moisture can be increased, wind erosion can be controlled, and fertility can

Figure 16.—**In the foreground, improved pasture on Hosmer silt loam, 12 to 18 percent slopes, eroded.**

be improved. Good management includes growing grasses and legumes that are adapted to the soil, adding lime and fertilizer, and keeping tillage to a minimum.

This soil is medium acid to strongly acid and is low in available phosphorus and potassium. Leaching is rapid. Fertilizer therefore should be added frequently, rather than in large amounts.

All areas of this soil are cleared of trees. Most of the areas are now used for pasture or are idle.

Management group Vw-1

Karnak silty clay, wet, is the only soil in this group. It is deep, light colored, and very poorly drained. The areas are nearly level and are on the bottom lands in depressions and sloughs and in other low areas. The surface layer and subsoil consist of silty clay. Permeability is very slow, and water-holding capacity is high. This soil is subject to frequent flooding. It remains wet for long periods, and cultivating it is impractical.

Wetness and flooding make this soil better suited to pasture, woodland, or wildlife than to other uses. Clearing and draining the soil is not feasible at present. Any areas that are cleared should be seeded to grasses that tolerate wetness and that can withstand flooding for long periods. Areas that are protected from flooding and that are adequately drained would be in management group IIIw-4.

This soil is very strongly acid to neutral. It is low to medium in available phosphorus and is medium in available potassium. Fertilizer should be applied only as a topdressing to pastures.

Most areas of this soil are in trees, though some small areas have been cleared. These small cleared areas are farmed intermittently. Most of the time, however, the cleared areas have a cover of vines and briers and of giant ragweed, smartweed, and other weeds.

Management group VIe-1

In this group are deep. light-colored, moderately well drained to well drained soils of the Alford, Hickory, and Uniontown series. These soils are slightly eroded to severely eroded. They are strongly sloping to moderately steep and are on terraces or are in the uplands. Permeability is moderate. The available moisture capacity is potentially high, but because of the slopes, much of the rain that falls runs off and is not held available for crops. The severe hazard of further erosion is the chief problem, but fertility also is a problem.

These soils are subject to further erosion if cultivated. They are better suited to pasture, woodland, wildlife, and recreational use than to other uses. Erosion can be controlled by keeping a cover of grasses and legumes or of trees on the areas. Lime and fertilizer also are needed. The severely eroded areas are cut in places by deep gullies that cannot be crossed with farm machinery. Establishing pastures in these areas is likely to be difficult.

Soils in this group are medium acid to very strongly acid. They are low in available phosphorus and are medium to high in available potassium.

Except for Alford silt loam, 18 to 30 percent slopes, eroded, these soils have been cleared of trees. Many of the areas have been poorly managed and now have a cover of briers, sprouts, and weeds. Some areas have been converted to pasture and are well managed. A few areas are farmed along with associated soils, and these areas are becoming more eroded.

Management group VIe-2

Shallow to deep, light-colored, moderately well drained to well drained soils of the Hosmer, Markland, Wellston, and Zanesville series are in this group. These soils are strongly sloping and are eroded. Except for the Markland soil, which is on the edge of terraces and in drainageways, the soils are in the uplands. The Hosmer and Zanesville soils have a fragipan, are moderately slowly permeable, and have moderate available moisture holding capacity. In the Markland soil, the surface layer is silt loam and the subsoil is clayey. This soil has moderate available moisture holding capacity and is slowly to very slowly permeable. The Wellston soil is shallow to sandstone, is moderately permeable, and has low to moderate available moisture holding capacity.

The soils in this group are subject to serious erosion if cultivated. Keeping a protective cover of trees or of grasses and legumes on the areas is the most practical way of controlling erosion. Adding lime and fertilizer helps plant roots to grow and thus reach more of the available moisture in these soils. If the areas are used for pasture, grasses and legumes should be planted that are adapted to the soils, and other good management must be used.

Soils in this group are very strongly acid or strongly acid. They are low in available phosphorus and are medium to high in available potassium.

Most areas of these soils have been cleared of trees and farmed at some time, but because of cultivation, have become eroded and are now idle. The soils in the Shawnee National Forest have been planted to pines. The soils under private ownership, however, remain idle and have a cover of scrub vegetation.

Management group VIIe-1

This group consists mainly of shallow to deep, moderately well drained or well drained soils of the Alford, Berks, Wellston, and Zanesville series. These soils are strongly sloping to steep and are moderately eroded to severely eroded. Alford silt loam, 30 to 60 percent slopes, which is a deep, moderately well drained to well drained soil and is wooded, is included with this group because of its severe erosion hazard when cleared. Most areas of the Alford soil are only slightly eroded or moderately eroded, but some areas are gullied. All of these soils are light colored and are in the uplands in the southern part of the county.

The Alford, Berks, and Wellston soils are moderately permeable, and the Zanesville soils, which have a fragipan, are moderately permeable above the fragipan and very slowly permeable in the fragipan. Available moisture holding capacity of the Alford soil is high. It is moderate in the Zanesville soils and low to moderate in the Berks and Wellston soils. Except in the Alford soil, sandstone bedrock or sandstone fragments are at a depth of less than 40 inches. Rocks of all sizes are common on the surface of Wellston-Berks complex, 12 to 60 percent slopes, eroded, and also are common in the bottoms of water courses in the areas. The hazard of erosion is severe.

If cultivated, the soils in this group are subject to severe erosion. The areas are better suited to woodland, wildlife, or recreational use than to other uses. It is difficult to establish pasture on these soils because of the slopes, many rocks, and gullies. For control of erosion, trees or other cover should be kept on the areas at all times. Some wooded areas of the Alford soil have been grazed. As a result gullies have formed in these areas. These gullies need to be stabilized, and the local representative of the Soil Conservation Service can provide the technical assistance needed.

Some areas of these soils have been cleared of trees and farmed but are now idle. Pines have been planted on areas once cleared that are now in the Shawnee National Forest.

Management group VIIw-1

Wallkill silty clay loam, wet, is the only soil in this group. It is deep and is very poorly drained. The areas are in depressions in old sloughs, oxbows, and abandoned channels. This soil consists of 12 to 30 inches of silty clay loam over muck or peat. Excess water and frequent flooding are severe problems.

Water is on or at the surface of this soil for most of the year, and cultivating the areas is not practical. Drainage is not feasible, because satisfactory outlets cannot be obtained. The areas are swampy. They are better suited to trees that tolerate wetness than to other uses, and trees are growing in the areas. The wetness severely limits the harvesting of trees.

Management group VIIs-1

This group consists of deep, light-colored very gently sloping to moderately steep soils of the Bloomfield and Sarpy series. These soils are on bottom lands or on terraces and uplands. Permeability is rapid, the water-holding capacity is low to very low, and the soil is extremely droughty.

This soil is better suited to trees than to cultivated crops or to hay and pasture crops. The areas are also suitable for wildlife or for recreation. A permanent cover of vegetation is needed. Most areas have trees on them, though shortage of soil moisture severely limits their growth.

General Management of Cultivated Soils

Soils used for cultivated crops need management practices that will maintain or improve their fertility, remove excess water, protect them from erosion, keep them in good tilth, and improve the supply of moisture available for crops.

Maintaining fertility.—In Gallatin County the soils range from very strongly acid to calcareous and from low to high in available phosphorus and potassium. All of the soils generally lack nitrogen. For favorable results, the soils should be tested, and lime and fertilizer applied in the amounts indicated by the tests. The response of crops to lime and fertilizer varies, but the response of crops to nitrogen generally is good.

Removing excess water.—Excess water is a problem on about 71,000 acres in this county (*21*). The poorly drained soils and some of the somewhat poorly drained soils require removal of excess water for best results. Removal of excess water also permits more timely tillage.

The kind of drainage system needed for removing excess water depends upon how easily water moves through the soil. The soils in this county that have a problem of excess water range from very slowly permeable to moderately permeable. Many of the soils are not permeable enough to be drained by tile, and some lack outlets. Surface ditches can be used in many areas to provide drainage. The local representative of the Soil Conservation Service should be consulted about suitable drainage methods.

Many of the soils on bottom lands in this county are subject to flooding. The individual farmer can do little to prevent flooding, because protection of an entire watershed generally is needed for adequate control of flooding.

Controlling erosion.—Soil erosion is a serious hazard on all sloping soils. In this county about 35,500 acres are subject to serious erosion (*21*). Erosion can be controlled by using a suitable cropping system; terracing cropland where slopes are less than 12 percent; establishing suitable grasses in waterways and outlets; and keeping tillage to a minimum. In addition all cultivating and planting should be on the contour; all crop residues should be returned to the soils; runoff from higher lying soils should be diverted to suitable outlets; and dams, grade stabilization structures, or other structures for controlling water should be installed where needed.

The soils in this county vary greatly in their ability to resist erosion because of wide differences in soil characteristics. The rate of erosion depends on the amount and intensity of rainfall; on the length and steepness of the slope; and on the permeability, the content of organic matter, the depth of rooting zone, and the texture of the soil. In addition, some of the soils have a fragipan, which keeps rainfall from penetrating deeply and thus increases runoff. Because characteristics that influence erosion are so variable, local technicians of the Soil Conservation Service and of the Extension Service should be consulted about methods needed for reducing soil losses.

Maintaining good tilth.—Maintaining good tilth is important for all of the soils. Tilth is the physical condition of a soil and reflects the ease with which a soil can be worked. If a soil is in good tilth, the texture and structure are good and the content of organic matter is high. When good tilth is maintained, more water enters the soil and is held available for crops than where tilth is poor. Also soil crusting is reduced and erosion is less serious.

Practices needed for maintaining or improving tilth are returning all crop residues to the soils, keeping tillage to a minimum, and cultivating the soils when they are not wet. Excessive tillage is likely to cause a plowpan or tillage pan to form in the soils. Such a pan reduces permeability and thus increases losses of soil and water. If tillage is done when the soils are wet, the plow layer is likely to become cloddy and difficult to work. As a result permeability is reduced, the soils remain wet late in spring, and planting is delayed. Several methods can be used to reduce tillage, and local farm advisers should be consulted for methods suitable for a particular soil.

Improving the supply of available moisture.—Soils vary in their ability to hold moisture needed for plant growth. This factor is particularly important to plants during the growing season. In many of the soils, the supply of moisture available to plants can be increased by increasing root growth and depth to which the roots penetrate through adding adequate amounts of fertilizer (*5*). Other methods that can be used to improve or maintain the supply of available moisture are increasing the content of organic matter by returning all crop residues to the soils and growing grasses and legumes to keep a cover of sod on the soils.

Predicted Yields

Table 4 gives predicted average acre yields of the principal crops grown in Gallatin County under two levels of management (*20*). These yields are averages for a 10-year period, 1955 through 1964, adjusted for the upward trend in yields at the end of this period. They include years when yields may range from 20 percent above or below the averages shown in the table, and years when yields are higher or lower than this range because of unusual weather. In columns A are yields to be expected under a moderately high level of management. In columns B are yields to be expected under a high level of management.

Under a moderately high level of management, commercial fertilizer and lime are applied, though not always in the kinds and amounts needed; some practices are applied for the control of erosion and to improve drainage; the cropping systems used, kinds of seeds planted, number of plants grown, supply of organic matter, and soil tilth generally are inadequate; methods of cultivating and control of weeds, diseases, and insects are ineffective; the combination of practices used is inefficient, and application is not always timely.

Under a high level of management, measures for drainage, flood control, and erosion control are adequate; the proper number of plants and of varieties of seed of high quality are used; tillage is kept to a minimum and is done when soil moisture is favorable; weeds, diseases, and insects are controlled; enough lime is applied to keep the pH of the soils at about 6.5 to 7.0, which is favorable for most crops; and phosphate and potash are applied according to the results of soil tests and previous treatment. This management also includes use of cropping systems that help to control erosion, maintain the supply of organic matter, and help in the production and use of nitrogen. In addition supplemental nitrogen is applied if needed; green-manure crops are grown, crop residues are returned to the soils, and barnyard manure is added. Also under this management, the harvesting of crops is done with the smallest possible loss; the combination of practices used is efficient; and all operations are timely.

TABLE 4.—*Predicted average acre yields of principal crops*

[Yields in columns A are those to be expected under a moderately high level of management, and yields in columns B are those to be expected under a high level of management. Absence of figures indicates that the crop is not well suited to the soil or that it is not commonly grown]

Soil	Corn		Soybeans		Wheat		Popcorn		Mixed hay [1]		Rotation pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Lbs.*	*Lbs.*	*Tons*	*Tons*	*Animal-unit-days* [2]	*Animal-unit-days* [2]
Alford silt loam, 1 to 4 percent slopes	79	90	29	32	34	38	2, 800	3, 100	3. 1	3. 4	150	165
Alford silt loam, 4 to 7 percent slopes, eroded	72	82	26	30	28	32	2, 500	2, 700	2. 7	3. 0	130	145
Alford soils, 4 to 7 percent slopes, severely eroded	63	71	23	26	25	28	2, 200	2, 500	2. 5	2. 8	120	135
Alford silt loam, 7 to 12 percent slopes, eroded	69	76	24	27	26	29	2, 300	2, 600	2. 6	2. 9	125	140
Alford soils, 7 to 12 percent slopes, severely eroded	59	66	22	24	23	27	2, 100	2, 300	2. 4	2. 7	115	130
Alford silt loam, 12 to 18 percent slopes, eroded	62	70	23	26	24	28	2, 100	2, 400	2. 4	2. 7	115	130
Alford soils, 12 to 18 percent slopes, severely eroded [3]	----	----	----	----	----	----	----	----	2. 2	2. 5	105	120
Alford silt loam, 18 to 30 percent slopes, eroded [3]	----	----	----	----	----	----	----	----	2. 3	2. 6	110	125
Alford soils, 18 to 30 percent slopes, severely eroded [3]	----	----	----	----	----	----	----	----	2. 0	2. 3	95	110
Alford silt loam, 30 to 60 percent slopes	----	----	----	----	----	----	----	----	2. 2	2. 5	105	120
Alford-Bold complex, 7 to 12 percent slopes, eroded	67	73	23	26	25	28	2, 400	2, 600	2. 6	2. 9	125	140
Allison silty clay loam	88	99	33	37	----	----	3, 100	3, 500	3. 2	3. 5	----	----
Alvin fine sandy loam, 0 to 2 percent slopes	65	78	24	30	26	30	2, 300	2, 700	2. 8	3. 1	135	150
Alvin fine sandy loam, 2 to 4 percent slopes	60	73	21	25	23	27	2, 100	2, 600	2. 6	2. 9	125	140
Alvin fine sandy loam, 4 to 10 percent slopes, eroded	50	60	18	23	17	24	1, 800	2, 100	2. 3	2. 6	110	125
Alvin soils, 6 to 12 percent slopes, severely eroded	44	51	14	19	16	21	1, 500	1, 800	1. 9	2. 2	90	105
Alvin fine sandy loam, 12 to 30 percent slopes, eroded	45	53	16	20	17	23	1, 600	1, 900	1. 9	2. 1	90	100
Ava silt loam, 2 to 4 percent slopes	54	66	20	25	23	28	1, 900	2, 300	2. 3	2. 5	110	120
Ava silt loam, 4 to 7 percent slopes	53	64	19	24	23	27	1, 900	2, 200	2. 1	2. 4	100	115
Ava silt loam, 4 to 7 percent slopes, eroded	42	52	15	19	18	22	1, 500	1, 800	1. 8	2. 1	85	100
Ava soils, 7 to 16 percent slopes, severely eroded [3]	----	----	----	----	----	----	----	----	1. 2	1. 6	70	85
Beaucoup silty clay loam	76	90	31	36	----	----	2, 700	3, 200	2. 5	2. 8	----	----
Belknap silt loam	66	79	29	34	30	34	2, 300	2, 800	2. 3	2. 8	110	135
Birds silt loam	50	70	24	28	19	23	1, 800	2, 500	2. 3	2. 7	110	130
Bloomfield fine sand, 1 to 12 percent slopes	27	40	10	18	13	20	900	1, 400	1. 0	1. 5	60	80
Bloomfield fine sand, 12 to 30 percent slopes [3]	----	----	----	----	----	----	----	----	. 7	1. 2	40	60
Bluford silt loam, 1 to 4 percent slopes	59	70	22	27	26	31	2, 000	2, 400	2. 2	2. 5	105	120
Bluford silt loam, 4 to 7 percent slopes, eroded	42	52	17	20	19	22	1, 500	1, 800	1. 8	2. 1	90	100
Bonnie silt loam	61	68	24	27	23	26	2, 100	2, 400	2. 0	2. 5	95	120
Burnside silt loam	61	68	24	27	27	30	2, 100	2, 400	2. 5	3. 0	125	150

See footnotes at end of table.

TABLE 4.—*Predicted average acre yields of principal crops*—Continued

Soil	Corn		Soybeans		Wheat		Popcorn		Mixed hay [1]		Rotation pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Lbs.*	*Lbs.*	*Tons*	*Tons*	*Animal-unit-days* [2]	*Animal-unit-days* [2]
Camden silt loam, 0 to 2 percent slopes	76	87	28	35	31	39	2,700	3,000	3.2	3.5	155	170
Camden silt loam, 2 to 4 percent slopes	69	80	25	30	29	35	2,400	2,800	3.1	3.4	150	165
Camden silt loam, 4 to 10 percent slopes, eroded	62	69	22	25	25	30	2,200	2,400	2.6	2.9	125	140
Camden soils, 4 to 7 percent slopes, severely eroded	57	64	20	23	24	26	2,000	2,200	2.5	2.8	115	130
Camden soils, 7 to 20 percent slopes, severely eroded	52	60	19	21	22	24	1,800	2,100	2.3	2.6	110	125
Creal silt loam, 1 to 5 percent slopes	60	73	24	29	28	33	2,100	2,600	2.2	2.5	105	120
Darwin silty clay	61	75	25	31			2,900	3,300			115	120
Darwin silt loam, overwash	65	80	27	34			3,000	3,400			115	120
Drury silt loam, 0 to 2 percent slopes	82	94	30	34	36	38	3,000	3,300	3.2	3.5	155	170
Drury silt loam, 2 to 7 percent slopes	78	89	28	32	34	36	2,700	3,100	3.1	3.4	150	165
Dupo silt loam	85	95	32	36	31	34	3,000	3,300	2.9	3.3	145	165
Emma silty clay loam, 0 to 2 percent slopes	64	84	28	40	28	39	2,300	2,900	2.8	4.0	140	200
Emma silty clay loam, 2 to 6 percent	59	78	25	37	25	37	2,000	2,600	2.5	3.8	125	190
Emma silty clay loam, 7 to 12 percent slopes, eroded	48	68	21	33	21	33	1,700	2,400	2.0	3.4	100	170
Harco silt loam	95	110	33	42	36	40	3,300	3,900	4.3	4.5	210	220
Harpster silty clay loam	90	100	33	40			3,100	3,500	4.0	4.2	200	210
Haymond silt loam	85	95	32	36	31	34	3,000	3,300	2.9	3.2	140	155
Hickory loam, 4 to 10 percent slopes, eroded	41	48	15	18	18	21	1,500	1,800	1.9	2.2	90	105
Hickory soils, 7 to 12 percent slopes, severely eroded	27	32	10	12	12	14	900	1,100	1.4	1.7	65	80
Hickory soils, 12 to 18 percent slopes, severely eroded [3]									1.3	1.6	60	75
Hickory loam, 18 to 30 percent slopes, eroded [3]									1.4	1.7	65	80
Hosmer silt loam, 1 to 4 percent slopes	58	68	21	25	25	29	2,000	2,400	2.0	2.7	100	135
Hosmer silt loam, 4 to 7 percent slopes	56	66	20	24	24	28	2,000	2,300	1.8	2.7	90	135
Hosmer silt loam, 4 to 7 percent slopes, eroded	45	53	17	20	19	22	1,600	1,900	1.6	2.5	80	125
Hosmer soils, 4 to 7 percent slopes, severely eroded	31	37	13	24	15	16	1,100	1,300	1.2	2.0	60	100
Hosmer silt loam, 7 to 12 percent slopes	54	62	19	23	20	24	1,900	2,200	1.6	2.5	80	125
Hosmer silt loam, 7 to 12 percent slopes, eroded	38	49	15	18	18	21	1,300	1,700	1.4	2.4	70	120
Hosmer soils, 7 to 12 percent slopes, severely eroded [3]					12	14			.9	1.8	45	90
Hosmer silt loam, 12 to 18 percent slopes, eroded	30	35	14	17	16	19	1,000	1,200	1.4	2.0	70	100
Hosmer soils, 12 to 18 percent slopes, severely eroded [3]									.8	1.6	40	80
Iva silt loam, 1 to 4 percent slopes	80	89	29	33	32	37	2,800	3,200	2.8	3.1	135	150
Jules silt loam	71	92	32	35	20	24	2,500	3,200	2.8	3.1	135	150
Karnak silty clay	60	70	24	28			2,100	2,400	2.0	2.5	100	125
Karnak silty clay, wet [3]											100	125
Lamont fine sandy loam, 1 to 4 percent slopes	51	59	19	21	22	25	1,800	2,100	2.0	2.3	100	115
Lamont fine sandy loam, 4 to 7 percent slopes	44	50	18	20	21	24	1,500	1,800	1.9	2.2	95	110
Lamont fine sandy loam, 7 to 12 percent slopes, eroded	34	39	12	14	13	16	1,200	1,400	1.0	1.7	50	95
Marissa silt loam	85	105	31	40	31	40	3,000	3,700	2.6	3.2	125	155
Markland silt loam, 1 to 4 percent slopes	50	65	19	25	20	27	1,500	2,300	2.0	2.6	100	130
Markland silt loam, 2 to 4 percent slopes, eroded	33	43	12	17	13	18	1,200	1,500	1.2	1.7	60	85
Markland silt loam, 4 to 7 percent slopes, eroded	30	40	11	16	12	17	1,000	1,400	1.0	1.5	50	75
Markland soils, 4 to 7 percent slopes, severely eroded [3]									.7	1.2	35	60
Markland silt loam, 7 to 12 percent slopes, eroded	27	37	10	14	10	15	900	1,300	.9	1.4	45	70
Markland silt loam, 12 to 18 percent slopes	39	49	14	19	15	20	1,400	1,700	1.3	1.8	65	90
McGary silt loam, 0 to 2 percent slopes	50	59	20	28	18	21	1,800	2,100	2.2	2.5	105	120
McGary silt loam, 2 to 4 percent slopes	49	58	19	26	18	21	1,700	2,000	2.1	2.4	100	115
McGary silt loam, 2 to 4 percent slopes, eroded	36	42	14	16	14	17	1,300	1,500	1.9	2.2	90	105
McGary silt loam, 4 to 7 percent slopes, eroded	35	41	14	16	14	17	1,200	1,400	1.5	1.8	70	85
Montgomery silty clay	80	90	28	36	26	30	2,800	3,200	3.5	3.8	160	180
Montgomery silt loam, overwash	83	95	30	38	28	33	2,900	3,400	3.5	3.8	160	180
Okaw silt loam	40	63	16	28	15	25	1,400	2,200	1.5	2.5	75	125
Onarga fine sandy loam, 1 to 4 percent slopes	71	77	27	29	29	32	2,500	2,700	3.0	3.5	150	175
Onarga fine sandy loam, 4 to 10 percent slopes	69	75	25	27	27	30	2,400	2,600	2.8	3.3	140	165
Patton silty clay loam	95	115	36	45	36	45	3,300	4,000	4.0	4.2	200	210
Petrolia silty clay loam	68	80	28	33	25	30	2,400	2,800	2.2	2.6	105	125
Piopolis silty clay loam	61	72	24	28	22	26	2,100	2,500	2.0	2.5	100	125
Plano silt loam, 0 to 2 percent slopes	85	100	30	35	33	37	3,000	3,500	4.0	4.2	200	210
Plano silt loam, 2 to 4 percent slopes	80	95	30	35	33	37	2,800	3,300	4.0	4.2	200	210
Racoon silt loam	47	74	23	30	20	30	1,600	2,600	2.0	3.0	100	150
Reesville silt loam, 0 to 2 percent slopes	73	85	30	35	30	35	2,600	3,000	3.0	3.5	150	175
Reesville silt loam, 2 to 4 percent slopes	70	82	29	34	29	34	2,500	2,900	3.0	3.5	150	175
Reesville silt loam, 2 to 4 percent slopes, eroded	52	60	28	33	19	22	1,800	2,100	2.4	2.7	115	130
Reesville silt loam, 4 to 7 percent slopes, eroded	50	58	20	23	18	21	1,800	2,000	1.9	2.2	95	110
Reesville soils, 4 to 7 percent slopes, severely eroded	36	42	15	17	14	16	1,300	1,500	1.7	2.0	85	100
Roby fine sandy loam, 0 to 2 percent slopes	67	75	27	30	29	32	2,400	2,600	2.2	2.5	105	120
Roby fine sandy loam, 2 to 7 percent slopes	63	70	25	28	27	30	2,200	2,500	2.0	2.3	100	115

See footnotes at end of table.

TABLE 4.—*Predicted average acre yields of principal crops*—Continued

Soil	Corn		Soybeans		Wheat		Popcorn		Mixed hay [1]		Rotation pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Lbs.*	*Lbs.*	*Tons*	*Tons*	*Animal-unit-days* [2]	*Animal-unit-days* [2]
Ruark fine sandy loam	40	62	18	28	18	28	1, 400	2, 200	1. 8	2. 8	90	140
Sarpy sand [3]											(4)	(4)
Sawmill silty clay loam	87	107	30	37	34	38	3, 000	3, 700	3. 5	4. 0	175	200
Sciotoville silt loam, 0 to 2 percent slopes	62	80	27	35	27	38	2, 200	2, 800	2. 7	4. 0	135	200
Sciotoville silt loam, 2 to 4 percent slopes	56	76	24	31	24	36	2, 000	2, 700	2. 4	3. 7	120	185
Sciotoville silt loam, 4 to 7 percent slopes, eroded	50	68	22	29	22	33	1, 800	2, 400	2. 2	3. 4	110	170
Sciotoville silt loam, 7 to 12 percent slopes, eroded	46	64	20	29	20	32	1, 600	2, 300	2. 0	3. 4	100	170
Sciotoville silt loam, 12 to 25 percent slopes, eroded	40	55	16	25	19	30	1, 400	1, 900	1. 8	3. 0	90	150
Sexton silt loam	58	78	26	31	25	28	2, 000	2, 600	2. 2	2. 5	105	120
Shiloh silty clay	76	85	32	34	29	33	2, 700	3, 000	2. 7	3. 0	135	150
Starks silt loam, 0 to 2 percent slopes	69	81	28	33	27	32	2, 400	2, 800	2. 4	2. 6	115	125
Starks silt loam, 2 to 6 percent slopes	67	79	25	32	27	32	2, 300	2, 800	2. 4	2. 6	115	125
Stoy silt loam, 0 to 2 percent slopes	68	80	26	31	30	35	2, 400	2, 800	2. 5	2. 7	120	130
Stoy silt loam, 2 to 4 percent slopes	58	68	22	26	25	30	2, 000	2, 400	2. 4	2. 6	115	130
Tice silty clay loam	81	95	32	36	31	35	2, 800	3, 300	2. 7	3. 0	130	145
Uniontown silt loam, 0 to 2 percent slopes	79	92	32	40	31	40	2, 800	3, 200	3. 5	3. 7	175	185
Uniontown silt loam, 2 to 4 percent slopes	72	85	29	35	29	35	2, 500	3, 000	3. 4	3. 6	170	180
Uniontown silt loam, 4 to 7 percent slopes, eroded	65	75	23	26	25	28	2, 300	2, 600	2. 7	3. 0	135	150
Uniontown soils, 4 to 7 percent slopes, severely eroded	60	66	21	23	22	25	2, 100	2, 300	2. 4	2. 8	120	140
Uniontown silt loam, 7 to 16 percent slopes, eroded	61	67	22	24	23	26	2, 100	2, 300	2. 6	2. 9	130	145
Uniontown soils, 10 to 25 percent slopes, severely eroded [3]									2. 0	2. 4	100	120
Wabash silty clay	76	83	30	33	26	30	2, 700	2, 900			115	120
Wakeland silt loam	76	85	31	34	31	35	2, 700	3, 000	2. 8	3. 1	135	150
Wallkill silty clay loam, wet [3]												
Weinbach silt loam, 0 to 2 percent slopes	50	75	20	34	21	31	1, 800	2, 600	2. 2	3. 3	110	165
Weinbach silt loam, 2 to 4 percent slopes	50	75	19	34	21	31	1, 800	2, 600	2. 2	3. 3	110	165
Wellston silt loam, 5 to 12 percent slopes, eroded	27	40	10	13	12	16	900	1, 300	. 9	1. 3	50	75
Wellston silt loam, 12 to 18 percent slopes, eroded [3]											50	75
Wellston soils, 12 to 18 percent slopes, severely eroded [3]											40	60
Wellston silt loam, 18 to 30 percent slopes, eroded [3]											30	50
Wellston-Berks complex, 12 to 60 percent slopes, eroded [3]											30	50
Worthen silt loam	94	104	34	38	36	45	3, 300	3, 600	4. 3	4. 5	215	225
Wynoose and Weir silt loams	53	62	22	26	24	28	1, 900	2, 200	2. 0	2. 4	100	120
Zanesville silt loam, 3 to 12 percent slopes, eroded	35	40	13	15	14	17	1, 200	1, 400	1. 0	1. 6	50	80
Zanesville silt loam, 12 to 18 percent slopes, eroded [3]									. 9	1. 5	45	75
Zanesville soils, 12 to 18 percent slopes, severely eroded [3]									. 6	1. 2	30	60
Zanesville silt loam, 18 to 30 percent slopes, eroded [3]									. 7	1. 4	35	70

[1] Hay and pasture yields are estimated for mixed stands of grasses and legumes adapted to the soil. For the kinds of hay and pasture to grow, see your local soil conservationist or extension adviser.

[2] A term used to express the carrying capacity of pasture. It is the number of animal units carried per acre multiplied by the number of days the pasture is grazed during a single grazing season without injury to the sod. An acre of pasture that provides 30 days of grazing for two cows has a carrying capacity of 60 animal-unit-days.

[3] Should be kept under permanent vegetation.

[4] Variable.

For corn, the major crop grown in the county, specific practices under a high level of management are:

1. Applying fertilizer according to the results of soil tests, past cropping history, and the yield expected.
2. Returning organic matter to the soil by turning under crop residues and adding barnyard manure.
3. Maintaining optimum soil structure by keeping tillage and traffic to a minimum and working the soils only when the content of moisture is favorable.
4. Planting hybrid seed that is best adapted to the soil and that will produce the number of plants recommended for the yield expected.
5. Controlling weeds, diseases, and harmful insects.
6. Harvesting the corn when it is mature so that the maximum crop is realized.
7. Making timely and careful application of all practices.

The predicted yields are based on data from experiments made by the Illinois Agricultural Experiment Station, and on the experience of farmers, agronomists, and conservationists. If data were lacking, yields were predicted by using a formula in which the effects of erosion and slope were considered.[4] As improved methods are developed and applied, the yields obtained under each level of management can be expected to increase.

[4] SOIL CONSERVATION SERVICE. SOILS. Ill. Tech. Note No. 10. Supplement No. 1, 11 pp., 1960. [Processed]

Use of the Soils for Woodland [5]

Forests originally covered all of the uplands and most or all of the bottom lands and terraces of Gallatin County before settlement. The early settlers cleared the uplands rapidly and planted them to cultivated crops. As fertility declined and erosion took its toll, the poorest areas were abandoned. Other areas, too steep to plow, were cut over extensively, and most of the good saw timber removed. Damaging fires and grazing were common. Thus, by the early 1930's much of the woodland in the uplands was in poor condition. Clearing of the terraces and bottom lands was slower because the soils are wet and clayey. Now, with the use of heavy equipment, the remaining forests on the bottom lands are being rapidly removed.

The Shawnee National Forest, established in 1933, now includes about 9,129 acres in Gallatin County. This land is being returned to full productivity as woodland. About 45,400 additional acres of woodland are on private farms throughout the county. The nearly 54,500 acres of woodland make up about 26 percent of the county. By 1975 this acreage is expected to decrease, perhaps by as much as 14,000 acres (*21*).

The major kinds of trees now grown for the market are red oak, white oak, black oak, pin oak, ash, sweetgum, tulip-poplar, cottonwood, soft maple, hickory, pecan, and sycamore. Several other species of oak are grown in smaller quantities, and small amounts of other hardwoods are sold. Several plantations of shortleaf and loblolly pine have been established by the Forest Service. Markets in or near the areas include local sawmill operators (fig. 17) and timber buyers who represent industries outside the county that use wood for various purposes.

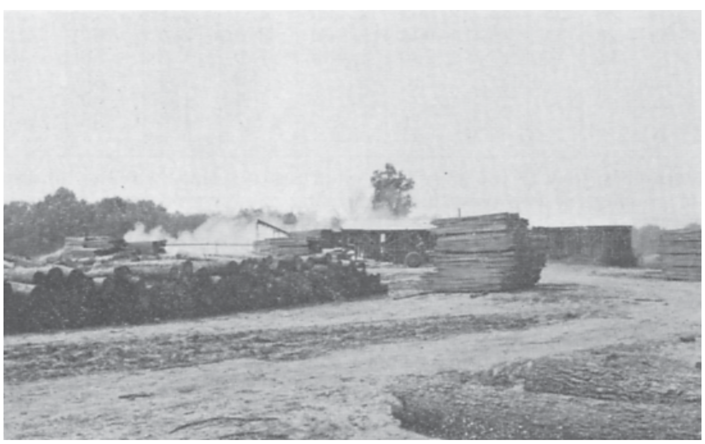

Figure 17.—**Local sawmill in Gallatin County.**

Woodland in the county also is valuable for watershed protection and for recreational purposes. In addition the areas provide food and cover for wildlife. Most of the woodland can be improved by better management, which would include preventing fire and controlling grazing. These practices are particularly important, for both fire and grazing destroy young seedlings, damage existing trees, and thus expose the soil to erosion.

[5] JOHN MILLETT, soil scientist, Mark Twain National Forest, U.S. Forest Service, Springfield, Mo.; JOHN COSTELLO, district forester, Division of Forestry, Illinois Department of Conservation, Benton, Ill.; JAMES MENZIE, farm forester, Division of Forestry, Illinois Department of Conservation; and CLARK W. RINKER, woodland conservationist, Soil Conservation Service; assisted in preparing this section.

Woodland suitability groups

The soils of Gallatin County have been placed in 12 woodland suitability groups on the basis of soil characteristics that affect the growth of trees. Each group is made up of soils that require similar management practices and that have about the same potential productivity for wood crops. The soils of the Harco, Jules, Marissa, Montgomery, Onarga, Patton, Plano, Sawmill, and Worthen series, however, were not placed in these groups. These soils are primarily agricultural, and trees generally are not grown on them.

In each woodland suitability group first the characteristics of the soils are described. Then information about suitable trees or trees to favor in existing stands is given. This is followed by the estimated production potential in terms of site index and the estimated average annual growth in board feet. Ratings for certain limitations or hazards that affect management are also included. The names of the soils in each woodland suitability group can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

In the paragraphs that follow the preference for adapted species in existing stands is discussed and planting information is given. Then explanation of site index, average annual growth per acre, and of the ratings for certain limitations and hazards are given. Following this each woodland suitability group is discussed.

TREE PREFERENCE AND PLANTING INFORMATION. Trees that should be given preference in existing stands are those that have a high market value and that grow well on the specified site. They should be protected and favored when stand improvement work is being done. Trees that are the least desirable are those that have low market value or undesirable growth habits. These are weed trees and should be discouraged or removed to allow growth of desirable trees.

In each woodland suitability group trees are listed in order of their suitability for planting in areas that are moderately eroded or are not eroded and in areas that are severely eroded and on hot sites and cool sites.

Pine generally is better suited to severely eroded soils than are hardwoods. Loblolly pine and shortleaf pine are suitable for planting, though Gallatin County is outside the natural range of these trees. After about 25 years these stands can be harvested for pulpwood. By then native hardwoods will have had an opportunity to regenerate and may be allowed to take over the stand.

Black locust is suitable for planting in severely gullied areas. It is grown mainly as a soil builder and as a nurse tree for other hardwoods that are interplanted with it (*13*). The locust borer is likely to cause severe damage, however, and few sound trees attain usable size.

Exposure, or aspect, greatly influences the intensity of sunlight that reaches the ground surface, thus influencing both air and soil temperature. South slopes are exposed to the sun and are hot during the summer. Soil moisture therefore evaporates rapidly, leaf litter decays readily, and productivity is less than on the cooler, more moist, north slopes that receive less intense sunlight. For some groups made up mainly of sloping soils on uplands, information is given for cool sites and hot sites in the group.

Soils on bottom lands and terraces generally are level to gently sloping or they have very short steep slopes. They are treated as cool sites. Although slopes of less than 12 percent generally are not considered significant, soils in groups 4 and 5 having a slope of less than 12 percent may be on ridgetops or on foot slopes, and location may be a site factor.

Cool sites include the lower two-thirds of all north, northwest, northeast, and east slopes; coves, foot slopes, and bottom lands; and slopes less than 12 percent on ridgetops more than about 600 feet wide or on gently rolling terrain.

Hot sites include all southeast, south, southwest, and west slopes that are more than 12 percent; narrow ridgetops less than 600 feet wide; and the upper third of northerly and easterly slopes of the ridges.

More detailed information about forestry planting practices can be obtained from a publication by the Illinois Technical Forestry Association (*10*).

SITE INDEX. Site index is the height in feet of dominant and codominant, free-growing trees of a given species at a specified age. For oak, height at age 50 years is used (*16*); for cottonwood, height at age 30 years is used (*3*); and for loblolly pine and shortleaf pine, height at age 25 years is used (*6*, *7*). The site indexes given in each woodland suitability group were determined by foresters of the Division of Forestry, Illinois Department of Conservation; the U.S. Forest Service; the University of Illinois; and the Soil Conservation Service, working with soil scientists of the Soil Conservation Service, who classified the soils. The data on which the indexes are based includes measurements taken from nearby counties as well as measurements taken in Gallatin County. For the most part, site index was determined for soil types that occur in this county, but a few are for soils that are similar to, but are not the same as, the soils in this county. The average and the range in site index given generally agree well with known timber yields and with growth data from other sources (*11*).

AVERAGE ANNUAL GROWTH PER ACRE. This is given in board feet, measured by the International Rule. The figures are for well-stocked, well-managed stands and are calculated to age 30 for cottonwood and to age 60 for other hardwoods. They are taken from data obtained by the Soil Conservation Service and from data in USDA Technical Bulletin 560 (*16*) and USDA Handbook 181 (*15*), and from tree growth data compiled by the Soil Conservation Service. Where site measurements were lacking, an estimate was made based on data by the Illinois Technical Forestry Association (*11*).

LIMITATIONS AND HAZARDS. Certain factors that affect the production of timber are related to the soil. Four such factors considered in Gallatin County are seedling mortality, plant competition, erosion hazard, and equipment limitation. These factors are rated as to whether the limitation or hazard is slight, moderate, or severe. They are explained in the paragraphs that follow.

Seedling mortality refers to the expected loss of natural or planted tree seedlings as a result of soil characteristics or topographic features, not as a result of plant competition. It is assumed that the natural seed supply is adequate, that the stock is good, that the seedlings are properly planted and cared for, and that climatic conditions are normal.

A rating of *slight* indicates an expected seedling mortality of up to 25 percent. A rating of *moderate* means that seedling mortality between 25 and 50 percent can be expected, and a rating of *severe*, that more than 50 percent mortality of seedlings can be expected.

Plant competition refers to the rate at which unwanted trees, shrubs, and weeds are likely to invade a given site when 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 problem. A rating of *moderate* means that plant competition develops but generally does not prevent an adequate stand from becoming established, and a rating of *severe*, that plant competition prevents desirable trees from restocking naturally.

Erosion hazard refers to the potential risk of erosion if the site is managed according to acceptable standards for woodland use. Factors that influence these risks are the length and steepness of the slopes and the characteristics of the soil. Placing roads and skidways in the soils also affect erosion. In addition the hazard of erosion is increased if the watershed above the wooded site is an open cultivated field.

A rating of *slight* indicates that control of erosion is not a special problem. A rating of *moderate* means that some care is needed to control erosion when harvesting is done. The rating *severe* means that intensive treatment, special equipment, and special methods of operation must be used to minimize soil loss.

Equipment limitation depends on soil characteristics and topographic features that restrict the use of equipment in planting, tending, or harvesting trees.

A rating of *slight* indicates that there is little or no restriction on the type of equipment used or of the time of year that it can be used. A rating of *moderate* means that the use of equipment is restricted because slopes are steep or because the soils are wet for periods of up to 3 months. The rating *severe* indicates that use of equipment is restricted because of very steep slopes that require special harvesting methods or because for more than 3 months during the year the soils are too wet for use of equipment.

WOODLAND SUITABILITY GROUP 1

This group consists of deep, light-colored, somewhat poorly drained soils of the Bluford, Creal, Iva, Reesville, Starks, Stoy, and Weinbach series. These soils are nearly level to moderately sloping. A few of them are moderately eroded or severely eroded. The Bluford, Iva, and Stoy soils are in the uplands, and the other soils are on terraces. All of these soils have a surface layer of silt loam. Their subsoil is silty clay loam. Permeability is moderately slow or slow, and available moisture capacity is high to very high.

Most areas of these soils are used for cultivated crops, though trees grow on some of the soils, and particularly, on the Weinbach. When improving the present stands, white ash, sweetgum, black oak, and cherrybark oak are the trees to favor. Hickory and soft maple are the least desirable trees for these soils.

On the soils in this group, loblolly pine, shortleaf pine, white pine, white oak, northern red oak, white ash, sycamore, and tulip-poplar are the most desirable trees to plant. Scotch pine is suitable only for growing Christmas trees.

The site index ranges from 60 to 70 for upland oaks. It is about 85 for sweetgum and about 45 for loblolly pine. The annual average growth of upland oaks ranges from 170 to 380 board feet per acre. The range in production, however, is likely to be greater than for most woodland groups, and in places the site index may be higher than here stated.

Seedling mortality is slight, and ordinarily natural regeneration takes place. White pine has better survival than hardwoods in severely eroded areas. It should therefore be planted on the severely eroded Reesville soils if these areas are planted to trees.

Plant competition is moderate. It generally does not keep desirable species from becoming established. Competition may delay natural regeneration of desirable trees, however, and may slow their initial growth.

Erosion is a hazard on slopes that lack a protective cover of vegetation. It is not a problem where ground cover is established and kept on the areas.

Equipment limitations are slight. Except for fairly short periods after rains, work can be done at any time of the year.

WOODLAND SUITABILITY GROUP 2

In this group are deep, light-colored, moderately well drained or well drained soils of the Camden, Drury, and Uniontown series. These soils are nearly level to strongly sloping and generally are slightly eroded or moderately eroded, but some areas are severely eroded. They are on terraces. Their surface layer is silt loam. The subsoil is silty clay loam in all except the Drury soils, which have a subsoil consisting of silt loam. Permeability is moderate, and available moisture capacity is high.

These soils are used chiefly for cultivated crops and pasture, but trees also grow well on them. In existing stands tulip-poplar, black walnut, white oak, northern red oak, cherrybark oak, sweetgum, white ash, Shumard oak, soft maple, and sycamore are the trees to favor. The least desirable trees for these soils are hickory, beech, blackgum, and sassafras.

Where erosion is slight to moderate, the most desirable trees to plant are cottonwood, black walnut, sweetgum, tulip-poplar, white oak, northern red oak, sycamore, white ash, loblolly pine, shortleaf pine, and white pine. Suitable for planting in severely eroded areas are loblolly pine, shortleaf pine, and white pine. Scotch pine can also be planted on slightly eroded to severely eroded areas, but they should be planted only for growing Christmas trees.

The site index ranges from 76.5 to 91.5 for upland oaks, and from 51 to 55 for sweetgum. The average annual growth is more than 350 board feet per acre for upland oaks. It is as much as 500 board feet per acre for tulip-poplar and sweetgum, and it possibly is more than this in fully stocked stands that are well managed.

Seedling mortality is slight. Pine seedlings grow rapidly, and the more desirable hardwoods also grow rapidly.

Plant competition is severe. It may be necessary to free the young trees from competition by cutting or otherwise removing nearby vegetation and branches. Weeding also may be necessary to remove less desirable trees that are overtopping or that are likely to overtop the young trees.

Erosion generally is not a problem. The steeper slopes generally are short, and the hazard of erosion from use of equipment is slight. In rolling areas care is needed in carrying out skidding operations to keep gullies from starting.

Conventional equipment normally can be used on these soils. Heavy equipment, however, is likely to cause damage after a heavy rain when the soils are wet.

WOODLAND SUITABILITY GROUP 3

Deep, light-colored, poorly drained soils of the Okaw, Racoon, Ruark, Sexton, Weir, and Wynoose series are in this group. These soils are nearly level and are on terraces or are in the uplands. Except for Ruark fine sandy loam, the surface layer is silt loam. The subsoil is silty clay loam to silty clay. Permeability is slow to very slow, and available moisture capacity is moderate to high.

These soils are used chiefly for cultivated crops, though pin oak, post oak, and other wetland trees grow well on these soils. Most wooded areas consist of pure stands of pin oak and post oak. Species to favor in improving existing stands are black oak, white oak, pin oak, northern red oak, white ash, swamp white oak, bur oak, and cherrybark oak.

The most desirable trees to plant on these soils are pin oak, sycamore, sweetgum, loblolly pine, and cottonwood.

The site index ranges from 57 to 85 for upland oaks and from 32 to 37 for loblolly pine. The annual average growth for upland oaks is 250 board feet per acre in stands that are well stocked and well managed.

Seedling mortality is slight, and ordinarily adequate regeneration takes place.

Plant competition is moderate. It generally does not keep desirable kinds of trees from becoming established. Because these soils are nearly level, erosion is not a problem.

Equipment limitations are moderate because of the poor drainage of these soils. During winter or when rainfall is greater than normal, periods of as much as 3 months may occur when heavy equipment cannot be used on these soils.

WOODLAND SUITABILITY GROUP 4

This group consists of moderately well drained soils that have a fragipan and are in the Ava, Hosmer, Sciotoville, and Zanesville series. These soils are nearly level to steep and are on terraces or are in the uplands. They are slightly eroded to severely eroded. Their surface layer is silt loam, and their subsoil is silty clay loam. The fragipan is brittle and is at a depth of 20 to 36 inches. Because of the fragipan, permeability is moderately slow and available moisture capacity is moderate. The fragipan also restricts depth to which tree roots can penetrate.

In improving the present stands, white oak, black walnut, black oak, and northern red oak are the trees to favor on cool sites. The trees to favor on hot sites are northern red oak, scarlet oak, white oak, and black oak. The least desirable trees for the soils in this group are hickory, maple, blackgum, persimmon, and sassafras.

The most desirable trees to plant on the soils that are slightly eroded to moderately eroded are white pine, loblolly pine, shortleaf pine, white oak, white ash, and tulip-poplar. On the severely eroded soils, loblolly pine and shortleaf pine are suitable for planting, though Gallatin County is north of the range of these trees. If loblolly pine and shortleaf pine are planted, they can be harvested for pulpwood when they attain the proper size. Then native hardwoods can be permitted to take over the stand. It may be desirable, however, to keep a cover of pine on some severely eroded areas. Black locust can be planted for gully control. Scotch pine can be planted on any of the soils, regardless of erosion, but only for growing Christmas trees.

The site index for upland oaks on cool sites is 80, but it ranges from 60 to 70 on hot sites. Many areas of the Ava and Hosmer soils are on ridgetops, which are hot sites, but these soils also occupy all slopes in more rolling and hilly areas on both hot and cool sites. Oaks are the most suitable trees for the Ava and Hosmer soils. The annual average growth rate for upland oaks ranges from 200 to 300 board feet per acre on cool sites. The range in productivity may be greater in stands that are fully stocked and are well managed.

Seedling mortality is slight on soils in this group, and adequate natural regeneration generally takes place. In severely eroded areas care is needed in preparing a seedbed for young seedlings. In such areas pine seedlings ought to be planted because survival is better than that of hardwood seedlings.

Plant competition is moderate. It generally does not keep desirable trees from becoming established but may slow initial growth of desirable trees.

Erosion is not a serious hazard. Nevertheless care is needed when logging is done and when roads are constructed to keep gullies from forming.

Equipment limitations are slight. Except for short periods after heavy rains or during thaws, common logging machinery can be used at any time of the year.

WOODLAND SUITABILITY GROUP 5

Deep, well-drained soils of the Alford, Bold, and Hickory series are in this group. These soils are gently sloping to steep and are in the uplands. They are mostly moderately eroded or severely eroded. Their surface layer is silt loam and their subsoil is silty clay loam, except for the Bold soil which is silt loam or silt throughout. Permeability is moderate, and available moisture capacity is high. Some areas of the Alford soils are calcareous at a depth of less than 40 inches, and the Bold soils are calcareous at the surface. In these calcareous soils, rooting depth is likely to be limited.

In improving the present stands, tulip-poplar, white oak, black walnut, white ash, sweetgum, northern red oak, and black oak are the trees to favor on cool sites. Trees to favor on hot sites are northern red oak, scarlet oak, black oak, and white oak. The least desirable trees for these soils are hickory, sassafras, blackgum, and hard maple. The greatest returns from woodland are realized if improvement is done in stands in coves and on the lower two-thirds of slopes that face north and east. Because of the length, aspect is particularly important where slopes are more than 18 percent.

In areas where erosion is slight to moderate, tulip-poplar, black walnut, white oak, white ash, and white pine are the most desirable trees to plant on cool sites, and loblolly pine, shortleaf pine, and black oak are suitable for hot sites. On the severely eroded soils, loblolly pine, shortleaf pine, and white pine are suitable for planting, and black locust can be planted for gully control. Scotch pine is suitable only for growing Christmas trees. If loblolly pine is planted, the trees can be harvested for pulpwood when they reach the proper size. Native hardwoods can then be permitted to take over the stand. It may be desirable, however, to keep a cover of pine on some severely eroded soils. Pine does not grow well on the calcareous Bold soil and in those parts of Alford soils that are shallow to calcareous material.

The site index ranges from 70 to 80 on cool sites, and from 54 to 68 on hot sites. It ranges from 90 to 110 for tulip-poplar on cool sites. The average annual growth for oaks ranges from as little as 100 board feet per acre on hot sites, or in areas where the soil is calcareous at or near the surface, to 320 board feet on other soils where the aspect is cool. In stands that are fully stocked and are well managed, the annual growth rate may range from 300 board feet per acre on hot sites to 600 board feet per acre on cool sites.

Seedling mortality is slight on slopes of less than 18 percent, and the expected loss of seedlings is less than 25 percent. Plantings of tulip-poplar can be made in open areas in thin stands of trees if the openings are fairly large, or if the diameter of the opening is at least as much as the height of the surrounding trees. Where slopes are more than 18 percent, seedling mortality is moderate. On these steep slopes adequate stands of desirable trees are somewhat difficult to establish, and 25 to 50 percent of the seedlings can be expected to be lost. Survival of seedlings is not a problem in coves. In abandoned, severely eroded areas, pine seedlings, rather than hardwood seedlings, should be planted first.

Competition from grasses, weeds, briers, brush, and undesirable trees is moderate to severe. It delays somewhat the regeneration of desirable trees. Initial growth is slow, but fully stocked stands eventually develop. Weeding once or twice removes trees that are overtopping, or are likely to overtop, the young trees and helps desirable kinds of trees to survive and grow.

Erosion is a severe hazard during harvesting on slopes of more than 7 percent, and gully erosion is particularly severe on slopes of more than 18 percent. Harvesting must be done across the slope wherever feasible. Roads, skid trails, and fire lanes must be carefully located.

Equipment limitations range from slight to severe, depending on the degree of slope. Track-type equipment is needed for general use on slopes of more than 18 percent. In these steep areas wheel-type tractors and trucks can be used only on roads that are well constructed. Roads are difficult to build and maintain on very steep slopes, that is, on slopes of more than 30 percent, and special equipment is needed.

WOODLAND SUITABILITY GROUP 6

In this group are moderately deep to shallow, well-drained soils of the Berks and Wellston series. These soils are gently sloping to steep and are in the uplands. They are moderately eroded or are severely eroded. Permeability is moderate, and available moisture capacity is moderate to low. Sandstone fragments make up more than 50 percent of all layers of the Berks soils, and Wellston soils are underlain by sandstone at a depth of less than 30 inches. Berks soils are mapped only in a complex with Wellston soils. In areas of the complex, large boulders that hinder use of machinery are common.

White oak, northern red oak, black oak, tulip-poplar, and scarlet oak are the trees to favor in improving the present stands. The least desirable trees on these soils are post oak, blackjack oak, hard maple, and beech.

Desirable trees to plant where erosion is slight to moderate are loblolly pine, shortleaf pine, white pine, and redcedar. In severely eroded areas shortleaf pine, loblolly pine, and redcedar are suitable for planting. Scotch pine is suitable only for growing Christmas trees.

Trees grow poorly on these soils. In places not enough merchantable timber is produced to make special management worthwhile. The areas are extensive and variations in the soils and in site capabilities are great. The average annual growth ranges from 70 to 200 board feet per acre. Management for improving the stands should be concentrated on the more productive soils.

Seedling mortality is severe. Less than 50 percent of the seedlings may survive, because of the thin soil and steep slopes. On abandoned, eroded areas pine should be planted first, rather than hardwood seedlings.

Plant competition is slight. It delays initial growth somewhat but causes few problems once the seedlings have become established.

Erosion is a serious hazard. All logging should be done on the contour, where feasible. Roads, skid trails, and fire lanes need to be carefully located to minimize the hazard of gully erosion.

Equipment limitation is moderate on slopes of less than 18 percent and severe on slopes of more than 18 percent. Large boulders and many rock outcrops on Wellston-Berks complex, 12 to 60 percent slopes, eroded, are a severe hazard to movement of ordinary equipment. Track-type equipment is suitable for general use, but special equipment is needed in steep areas. Wheel-type tractors and farm trucks can only be used on roads that are well constructed. Such roads are difficult to build and maintain on the steep slopes, and special equipment is needed.

WOODLAND SUITABILITY GROUP 7

Deep, somewhat poorly drained to well-drained soils of the Markland and McGary series are in this group. These soils are nearly level to strongly sloping and are slightly eroded to severely eroded. They are on terraces. Their surface layer is silt loam, and their subsoil is silty clay. The lower part of the subsoil is difficult for roots to penetrate because of its high content of clay. Permeability of the soils is very slow.

White oak, black oak, pin oak, and sweetgum are the trees to favor in the present stands. The least desirable tree in the stands is blackjack oak.

These soils are well suited to oaks that tolerate wetness, such as pin oak and post oak, and pure stands of post oak occupy many areas. Desirable trees to plant where erosion is slight are pin oak and redcedar. In severely eroded areas redcedar is suitable for planting. Scotch pine is suitable only for growing Christmas trees.

The average site index for upland oaks is about 60. Average annual growth for these trees is as much as 200 board feet per acre, and that for pin oak is as much as 300 board feet per acre.

Seedling mortality is moderate to severe. Survival of seedlings may be as low as 25 percent on the steep, eroded soils.

Plant competition is slight to moderate. On the nearly level soils, competition between species of trees is moderate, but on the steep, eroded soils, competition is slight.

Erosion is a severe hazard in sloping areas. Careful management is needed where logging is done to avoid both sheet and gully erosion.

Equipment limitations are moderate to severe. Wetness may delay harvesting as much as 3 months or more.

WOODLAND SUITABILITY GROUP 8

In this group are deep soils of the Alvin, Bloomfield, Lamont, Roby, and Sarpy series. The Roby soils are somewhat poorly drained, and the other soils are well drained to excessively drained. The soils are nearly level to very strongly sloping. Most of them are on terraces or are in the uplands, but Sarpy sand is on bottom lands. Except for Sarpy sand, the surface layer is fine sand or fine sandy loam. The subsoil is sandy clay loam to sandy loam. The substratum is very sandy and is unfavorable to growth of tree roots. Some of the soils are moderately eroded, and others are severely eroded.

In the Alvin soils permeability and available moisture capacity are moderate. The Bloomfield and Sarpy soils are rapidly permeable, and they have low to very low available moisture capacity. Permeability of the Lamont soils is moderately rapid, and available moisture capacity is low. In the Roby soils permeability is moderately slow and available moisture capacity is moderate.

When improving the present stands, white oak, northern red oak, white ash, sweetgum, and black oak are the trees to favor. Hickory and soft maple are the least desirable trees on these soils.

Where erosion is slight to moderate, loblolly pine, shortleaf pine, white pine, white oak, northern red oak, white ash, and sycamore are suitable trees to plant. Loblolly pine and shortleaf pine can be planted in the severely eroded soils. Scotch pine is suitable only for growing Christmas trees.

The site index ranges from 51 to 71 for upland oaks; from 74 to 76 for sweetgum; and from 48 to 68 for black walnut. The average annual growth rate for upland oak ranges from less than 100 board feet per acre for the Bloomfield soils to more than 300 board feet per acre for the Alvin soils.

Seedling mortality is moderate. Initial growth may be slowed by lack of moisture, but satisfactory stocking generally can be obtained on all except the Bloomfield and Sarpy soils. The Bloomfield and Sarpy soils are droughty, and seedling mortality on them may be as much as 50 percent.

Plant competition is moderate. It generally does not keep an adequate stand of trees from being established. Hickory, sassafras, persimmon, and other undesirable trees should be removed and the more desirable trees present favored.

Erosion is a hazard on the more sloping soils. Good harvesting practices are needed to keep gullies from starting. Practices should be avoided that leave the Bloomfield and Sarpy soils bare for any period.

Equipment limitations are slight, and machinery can be used on these soils at any time of the year. Using equipment with wide tracks on the Bloomfield and Sarpy soils may keep heavy equipment from sinking in loose sand.

WOODLAND SUITABILITY GROUP 9

Deep, somewhat poorly drained to well drained, light-colored to moderately dark colored soils of the Allison, Belknap, Burnside, Dupo, Emma, Haymond, Tice, and Wakeland series are in this group. These soils are nearly level to sloping and are on low terraces or are on bottom lands. Their surface layer is silt loam or silty clay loam. Permeability is moderate to moderately slow. Available moisture capacity generally is high to very high. In the Burnside soil, however, sandstone fragments or sandstone bedrock is at a depth of less than 30 inches. In this soil available moisture capacity therefore is low to moderately low, depending on the depth to rock. Roots normally penetrate to a depth between 20 and 40 inches in the Burnside soil. The soils in this group are not protected by levees and are subject to flooding.

Cottonwood, sycamore, tulip-poplar, Shumard oak, cherrybark oak, sweetgum, green ash, and soft maple are the trees to favor in improving the present stands. The least desirable trees on these soils are red elm, white elm, hickory, and blackgum.

Suitable trees for planting on these soils are sycamore, tulip-poplar, black walnut, sweetgum, cottonwood, and soft maple.

The site index for bottom-land hardwoods ranges from 79 to 105. It ranges from 90 to 105 for sycamore and cottonwood. The soils in this group are the most productive in the county for trees. Cottonwood grows more rapidly than any other bottom-land hardwood, and in places annual average growth of this tree is more than 800 board feet per acre. The soils also are suitable for cultivated crops, and much of the acreage has been cleared or is being cleared rapidly for that purpose.

Seedling mortality is slight on these soils. Adapted trees readily become established.

Plant competition generally is severe. Control or removal of undesirable trees is necessary. Clearing, disking, chemical spraying, and other similar methods of preparing a seedbed help in restocking desirable trees and in assisting new plantings to get started. In particular, before cottonwood seedlings can become established, competition from other plants must be controlled.

Erosion generally is not a hazard, but the more sloping Emma soil is eroded.

Machinery can be used most of the year on the well-drained Allison and Haymond soils. On the other soils machinery cannot be used without serious damage to tree roots and soil structure for periods of as long as 3 months during the wet season.

WOODLAND SUITABILITY GROUP 10

In this group are deep, light-colored, poorly drained soils of the Birds and Bonnie series. These soils are nearly level and are on bottom lands. The profile is silt loam throughout. Permeability is low, and available moisture capacity is high. No obstruction to root development is present.

Pin oak, swamp white oak, sweetgum, sycamore, and other hardwoods that grow well on wet bottom lands are suitable for these soils. In many places pin oak occurs naturally in nearly pure stands.

The site index for bottom-land hardwoods ranges from 73 to 87. It ranges from 90 to 100 for cottonwood. Pin oak grows rapidly on these soils. Its average annual growth in saw logs is more than 600 board feet per acre.

Seedling mortality is slight for most adapted trees. Plant competition is moderate, and desirable trees reproduce and grow well. It is difficult, however, for cottonwood or sycamore to get started unless elm, willow, hickory, and other less desirable trees that occur naturally are removed.

Erosion is not a problem on these soils. Equipment limitations, however, are severe. These soils are wet, and generally for more than 3 months of each year equipment should not be used on them. Using common woodland equipment when the soils are wet damages tree roots and soil structure.

WOODLAND SUITABILITY GROUP 11

Deep, light-colored to dark-colored soils of the Beaucoup, Darwin, Harpster, Karnak, Petrolia, Piopolis, Shiloh, and Wabash series are in this group. These soils are nearly level and are on bottom lands or low terraces. Their profile is silty clay or silty clay loam throughout. Permeability is moderately slow to very slow, and available moisture capacity is moderate to high. Roots penetrate the soils easily.

The Harpster soil is calcareous, and the Wabash soil is calcareous in places. Both are dark colored. The Beaucoup, Darwin, and Shiloh soils, and most areas of the Wabash soil, are slightly acid to neutral. These soils are moderately dark colored to dark colored. The Karnak, Petrolia, and Piopolis soils are light colored and are medium acid to very strongly acid. Darwin silt loam, overwash, consists of deposits of silty material 10 to 20 inches thick over Darwin soils.

Pin oak, swamp white oak, and other trees that can tolerate wetness grow well on these soils. The site index for pin oak ranges from 85 to 95. In many places pin oak occurs in nearly pure stands and the trees are 70 to 100 feet tall and are as much as 24 inches in diameter. Pin oak and soft maple are better suited to Beaucoup, Petrolia, and Piopolis soils than to other soils in the group, and pecan trees generally grow on the moderately dark colored and dark colored soils.

Seedling mortality is slight. Cottonwood and sycamore, however, have difficulty getting started unless other naturally occurring, less desirable trees are removed.

Plant competition is severe. These soils are wet, and other plants compete severely with desirable trees for moisture. Special management and special preparation of the site are needed for adequate regeneration and growth. Elm, willow, hickory, and other less desirable trees should be eliminated wherever more desirable trees can be favored.

Erosion is not a problem on these soils. Equipment limitations, however, are severe. The soils are wet, and use of common woodland equipment is limited for several months each year.

WOODLAND SUITABILITY GROUP 12

This group consists of Karnak and Wallkill soils that are on bottom lands and are subject to overflow or are ponded. These soils are covered by water or have a high water table. The water table is at a depth of less than 6 inches as much as 6 months or more each year in the Karnak soil, and for the entire year in the Wallkill soil. The Karnak soil is silty clay throughout the profile. The surface layer of the Wallkill soil is silty clay loam. It is underlain by muck and peat. Permeability, available moisture capacity, and natural drainage of these soils are masked by excess water, which severely limits rooting depth.

Most areas of these soils are wooded. Established trees grow rapidly on these soils. The site index ranges from 70 to 90 and is similar to that for less wet soils in the same series in other counties. Fewer trees, however, are adapted to the wet soils.

Seedling mortality is severe because of the excess wetness and the high water table. In the wettest areas the only suitable trees are cypress and tupelo-gum.

Plant competition is slight to moderate, depending on the length of time water stands on the areas. Where the soils are dry for 5 to 8 months of the year, undesirable plants grow rapidly. Here some control of competing plants is needed to give desirable trees a chance to grow. Where the water table is high or water stands on the areas throughout the year, competition from other plants is slight.

Erosion is not a problem on these soils. Equipment limitations, however, are severe. Equipment cannot be operated on the Karnak soil for as much as 6 to 9 months of the year, and on the Wallkill soil, for the entire year. Wide-track equipment must be used, since the soils are wet and soft most of the time.

Use of the Soils for Recreation[6]

This section is designed to help determine the suitability of the soils of Gallatin County for development of recreation areas. Some of the soil properties that affect such use are soil texture, permeability, steepness of slope, depth to hard bedrock, wetness, and the hazard of flooding. On the basis of these and related soil characteristics, soils having similar properties have been placed in groups and rated for specific recreational purposes. Not considered in the ratings are such factors as nearness to lakes or streams or other scenic qualities of a specific area, though these may be of prime importance in selecting a site. The location of streams, roads, wooded areas, and other features considered desirable in selecting a site for recreation can be determined by consulting the soil maps at the back of this survey.

The ratings and the nature of the soil limitations that influenced the ratings are given in table 5 for each recreation group. *These ratings are general, and onsite investigation is necessary for detailed planning.* Ratings used are *slight*, *moderate*, *severe*, and *very severe*.

A rating of *slight* means that the soils are relatively free of limitations, and no limitations are shown. Some examples of *slight* limitations are slight hazard of erosion, poor trafficability immediately after a rain on soils that have a surface layer of silt loam, and low fertility. Many of the soils in Gallatin County have slight limitations that do not seriously interfere with their use for recreation. The section "Descriptions of the Soils" can be referred to for more specific information on a particular soil.

A rating of *moderate* indicates that the soils have limitations but can be used under careful planning and design and under good management.

A rating of *severe* means that the soils have limiting characteristics, which make use of the site for recreation questionable, and careful planning and special management are required.

A rating of *very severe* means that use generally is not practical and that extraordinary measures would be required. In addition to the soils listed in table 5, marshy and swampy areas, river sloughs, rock outcrops, and the like are considered to be areas having *very severe* limitations for recreational use.

In the paragraphs that follow a discussion of specific limitations of the soils for selected recreational use is given.

Soil limitations for recreational buildings.—The ratings in table 5 apply to areas to be developed for seasonal use or year-round use of cottages, washrooms, picnic shelters, and service buildings. Factors considered are mainly degree of wetness, hazard of flooding, degree of slope, permeability, soil texture, and depth to hard bedrock. The ratings assume that basements and underground utilities may be needed. Thus soils that are shallow to bedrock would have severe limitations for recreational buildings. If excavation is not needed, however, then the bedrock would be an asset and provide a firm foundation for a recreational building.

The ratings in table 5 were made without regard for onsite sewage disposal. Many of the soils in the county are slowly permeable and have a high water table. These factors seriously hinder the functioning of a septic tank filter field and may cause the system to fail. Some of the soils, therefore, that have slight limitations for recreational buildings may have severe limitations if a septic tank and a disposal field are needed. If such sanitary facilities are planned for recreational buildings, information about use of such soil as a disposal field for a septic tank system can be obtained from table 8 in the subsection "Use of the Soils for Engineering," which gives engineering interpretations.

Detailed onsite investigation usually is needed when selecting a site for a specific building. The soils in the county generally will support light structures characteristic of recreation areas, but information about the bearing capacity of each soil is needed for heavier buildings. The ratings in table 5 do not specifically consider the bearing capacity of the soils, but estimates can be made from information in tables 7 and 8 in the subsection "Use of the Soils for Engineering."

[6] By ROBERT L. SHIELDS, assistant State soil scientist, Soil Conservation Service.

Soil limitations for campsites for tents and trailers.— In table 5 ratings also are given for limitations of the soils for use for campsites for tents and trailers. These ratings apply to areas suitable for intensive use during the camping season. The areas ought to require little site preparation to be made suitable for unsurfaced parking for cars and camp trailers and for heavy traffic by people, horses, or motor vehicles. The main factors considered are wetness, hazard of flooding, permeability, degree of slope, and texture of the soil. Not considered is suitability of the soil for supporting specific kinds of vegetation, which should be determined when making the final evaluation in selecting a site.

Soil limitations for picnic areas, parks, and extensive play areas.— The ratings in table 5 apply to areas suitable for heavy foot traffic and for use for pleasure outings at which a meal is eaten outdoors. They also apply to areas suitable for use by people to gain healthful exercise out of doors. Such areas generally have a cover of grass, trees, or shrubs. The ratings are based mainly on degree of wetness, hazard of flooding, degree of slope, and texture of the surface soil. They do not consider nearness to water, presence of trees, or other features that would add scenic value and affect the desirability of a particular site.

Soil limitations for playgrounds, athletic fields, and intensive play areas.—These areas are used for playgrounds, for tennis and badminton courts, for football and baseball fields, and for other organized play. The areas are subject to heavy foot traffic and must be nearly level. Also soil texture must be good and soil consistence firm. The areas also must be able to support a good cover of vegetation.

Soil limitations for paths and trails.—These ratings apply to areas used for trails, cross-country hiking, bridle paths, and nonintensive uses that allow for random movement of people. Characteristics considered are degree of wetness, hazard of flooding, degree of slope, soil texture, and the presence of stones and rocks. It is assumed that the areas will be used as they occur in nature and that little excavating or moving of soil will be done.

Soil limitations for golf fairways.—Soils that are used as golf fairways should be well drained, free of flooding during periods of use, and have good trafficability. They also should contain few coarse fragments or stones and be capable of supporting a good turf. In addition slopes should be gently undulating. Not considered in the ratings are limitations for greens, traps, hazards, and tees. These generally are manmade from disturbed and transported material.

Use of the Soils for Engineering[7]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of engineering projects. The properties most important to engineers are permeability to water, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and reaction. Also important are depth to water table, flooding hazard, depth to bedrock, and relief. Such information is made available in this section. Engineers can use it to—

1. Make studies that will aid in selecting and developing sites for industries, businesses, residences, and recreational areas.
2. Assist in planning and designing erosion and flood control structures, drainage improvements, farm ponds, irrigation systems, and other structures for soil and water conservation.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways, airports, pipelines, and cables, and in planning more detailed surveys for the selected locations.
4. Locate probable sources of sand, gravel, and other materials suitable for construction needs.
5. Correlate pavement performance with soil mapping units, and thus develop information that will be useful in designing and maintaining pavements.
6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs.

It should be emphasized that the interpretations made in this soil survey are not a substitute for the sampling and testing needed at a site chosen for a specific engineering work that involves heavy loads or at a site where excavations are to be deeper than the depths of the layers here reported. Also, engineers should not apply specific values to the estimates for bearing capacity given in this survey. Nevertheless, by using this survey, an engineer can select and concentrate on those soil units most important for his proposed kind of construction, and in this manner reduce the number of soil samples taken for laboratory testing and complete an adequate soil investigation at minimum cost.

The soil mapping units shown on the maps in this survey may include small areas of a different soil material. These included soils may be as much as 2 acres in size. They are too small to be mapped separately and generally are not significant to the agriculture in the area but may be important in engineering planning.

Information of value in planning engineering work is given throughout the text, particularly in the sections "Descriptions of the Soils" and "Formation and Classification of Soils."

Some of the terms used by the scientist may be unfamiliar to the engineer, and some words—for example, soil, clay, silt, and sand—have special meaning in soil science. These and other special terms used in the soil survey are defined in the Glossary at the back of this survey. Most of the information about engineering is given in tables 6, 7, and 8.

Engineering classification systems

Agricultural scientists of the United States Department of Agriculture classify soils according to texture.

[7] HERBERT L. DAVENPORT and OWEN LEE, agricultural engineers, Soil Conservation Service, assisted with this section.

297-851—69——7

TABLE 5.—*Estimated degree and kinds of*

[The ratings slight, moderate, and

Recreation group, soil series, and map symbols	Recreational buildings	Campsites for tents and trailers
Group 1. Well drained to moderately well drained, moderately permeable, medium textured to moderately coarse textured, nearly level to moderately sloping soils in the uplands and on terraces: Alford (308B, 308C2, 308C3). Alvin (131A, 131B, 131C2). Camden (134A, 134B, 134C2, 134C3). Drury (75A, 75B). Hickory (8C2). Jules (28).[1] Lamont (175B, 175C). Onarga (190B, 190C). Plano (199A, 199B). Uniontown (482A, 482B, 482C2, 482C3). Worthen (37).	Slight	Slight
Group 2. Moderately well drained to well drained, slowly permeable and moderately slowly permeable, medium textured to moderately fine textured, nearly level to moderately sloping soils in the uplands and on terraces that have limited root depth: Ava (14B, 14C, 14C2). Hosmer (214B, 214C, 214C2, 214C3). Markland (467B, 467B2, 467C2, 467C3). Sciotoville (462A, 462B, 462C2),	Slight	Moderate: permeability; dries slowly.
Group 3. Somewhat poorly drained, slowly permeable and moderately slowly permeable, mostly medium textured to moderately fine textured, nearly level to moderately sloping soils in the uplands and on terraces: Bluford (13B, 13C2). Creal (337B). Harco (484). Iva (454B). Marissa (176). McGary (173A, 173B, 173B2, 173C2). Reesville (723A, 723B, 723B2, 723C2, 723C3). Roby (184A, 184B). Starks (132A, 132B). Stoy (164A, 164B). Weinbach (461A, 461B).	Moderate: seasonal high water table; subject to frost heaving.	Moderate: seasonal high water table; permeability; dries slowly.
Group 4. Well drained to moderately well drained, moderately permeable to slowly permeable, mostly medium textured to moderately fine textured, strongly sloping, moderately eroded to severely eroded soils in the uplands and on terraces: Alford (308D2, 308D3). Alford-Bold (985D2). Alvin (131D3). Ava (14D3). Camden (134D3). Hickory (8D3). Hosmer (214D, 214D2, 214D3). Lamont (175D2). Markland (467D2). Sciotoville (462D2). Uniontown (482D2). Zanesville (340D2).	Moderate: slopes	Moderate: slopes
Group 5. Well drained to moderately well drained, moderately permeable to slowly permeable, mostly medium textured to moderately fine textured, moderately steep to very steep, moderately eroded and severely eroded soils in the uplands and on terraces: Alford (308E2, 308E3, 308F2, 308F3, 308G). Alvin (131E2). Hickory (8E3, 8F2). Hosmer (214E2, 214E3). Markland (467E). Sciotoville (462E2). Uniontown (482E3). Zanesville (340E2, 340E3, 340F2).	Severe: slopes	Severe: slopes
Group 6. Well drained, moderately permeable, medium textured to moderately fine textured, mostly moderately steep and steep soils in the uplands; bedrock is at or near the surface: Wellston (339D2, 339E2, 339E3, 339F2). Wellston-Berks (986F2).	Severe: slopes; bedrock near surface; possible slippage on sides of hills.	Severe: slopes; bedrock near surface and crops out in places.

See footnote at end of table.

limitations of the soils for recreational use

severe are defined in the text]

Picnic areas, parks, and extensive play areas	Playgrounds, athletic fields, and intensive play areas	Paths and trails	Golf fairways
Slight	Moderate on 2 to 7 percent slopes and grading and leveling are needed, but slight on 0 to 2 percent slopes.	Slight	Moderate on 4 to 7 percent slopes, but slight on 0 to 4 percent slopes.
Moderate: permeability; dries slowly.	Moderate: slopes; permeability; dries slowly.	Slight	Slight.
Moderate: seasonal high water table; permeability; dries slowly.	Moderate: seasonal high water table; permeability; dries slowly; slopes of 2 to 7 percent are a moderate limitation; grading and leveling needed.	Moderate: seasonal high water table; permeability; dries slowly.	Moderate: seasonal high water table; dries slowly; some areas are sloping.
Moderate: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes.
Severe: slopes	Severe: slopes	Moderate on slopes of 12 to 18 percent; severe on slopes of more than 18 percent.	Severe: slopes; erosion hazard.
Severe: slopes; bedrock near surface and crops out in places.	Severe: slopes; bedrock near surface and crops out in places.	Severe: slopes; cuts expose bedrock; some stones on surface.	Severe: slopes; droughty; hard to maintain vegetation; bedrock crops out in places.

TABLE 5.—*Estimated degree and kinds of*

Recreation group, soil series, and map symbols	Recreational buildings	Campsites for tents and trailers
Group 7. Well-drained, rapidly permeable, moderately sloping soils that are droughty and are subject to wind erosion: Bloomfield (53C, 53E).	Moderate for slopes up to 12 percent and severe for slopes steeper than 12 percent; highly erodible; loose, fine sand; may slough in excavations.	Moderate for slopes up to 12 percent and severe for slopes steeper than 12 percent; subject to blowing; droughty; hard to maintain vegetation; slopes; areas left bare are highly erodible; soils are sandy and lack a firm surface.
Group 8. Poorly drained, moderately permeable, moderately fine textured to fine textured, level to depressional soils in the uplands and on terraces: Harpster (67). Patton (142).	Severe: seasonal water table near surface; subject to ponding; dries out slowly in spring; subject to frost heaving.	Severe: seasonal water table near surface; subject to ponding; dries out slowly in spring; slippery and sticky when wet.
Group 9. Poorly drained to very poorly drained, slowly permeable to very slowly permeable, mostly medium-textured to fine-textured, level to depressional soils in the uplands and on terraces: Montgomery (465, 465+). Sexton (208). Okaw (84). Shiloh (138). Racoon (109). Wynoose. Ruark (178).[2]	Severe: permeability; seasonal water table near the surface; subject to ponding; dries slowly; slippery and sticky when wet; hard and rough when dry; subject to frost heaving; high shrink-swell potential.	Severe: seasonal water table near the surface; permeability; subject to ponding; dries slowly; slippery and sticky when wet; hard and rough when dry.
Group 10. Well drained to moderately well drained, moderately permeable and moderately slowly permeable, medium textured to moderately fine textured, mostly nearly level soils on flood plains and alluvial fans.[3] Allison (306). Emma (469A, 469B, 469D2). Burnside (427). Haymond (331).	Severe: subject to flooding	Severe: subject to flooding
Group 11. Somewhat poorly drained, moderately permeable and moderately slowly permeable, medium textured to moderately fine textured, nearly level soils on flood plains: Belknap (382). Tice (284). Dupo (180). Wakeland (333).	Severe: subject to flooding; seasonal high water table; dries slowly in spring.	Severe: subject to flooding; seasonal high water table; dries slowly in spring.
Group 12. Poorly drained to very poorly drained, moderately slowly to very slowly permeable, medium-textured to fine-textured, nearly level soils on flood plains[4]: Beaucoup (70). Petrolia (288). Birds (334). Piopolis (420). Bonnie (108). Sawmill (107). Darwin (71, 71+). Wabash (83). Karnak (426).	Severe: subject to flooding; permeability; seasonal water table near the surface; slippery and sticky when wet; hard and rough when dry; moderate to high shrink-swell potential; surface cracks when dry; difficult to drain; dries slowly.	Severe: subject to flooding; permeability; seasonal water table near the surface; slippery and sticky when wet; hard and rough when dry; dries slowly; difficult to drain.
Group 13. Well-drained, rapidly permeable, gently sloping, sandy soils that generally are subject to flooding: Sarpy (92).	Severe: subject to flooding in most places; droughty; hard to maintain vegetation; subject to blowing; sand likely to slough in excavations.	Severe: subject to flooding in most places; soil is sandy and lacks a firm surface; subject to blowing; droughty; hard to maintain vegetation.
Group 14. Very poorly drained, level soils that are subject to flooding or ponding and that have water standing on them for most of the year.[5] Karnak (W426). Wallkill (W464).	Very severe	Very severe

[1] Subject to flooding when the Ohio River is at extremely high flood stage.

[2] The surface layer is fine sandy loam and trafficability is somewhat better than for other soils in the group.

[3] Flooding is the chief limitation; all other features are favorable, and each site should be evaluated on the basis of intensity of use and frequency of flooding.

limitations of the soils for recreational use—Continued

Picnic areas, parks, and extensive play areas	Playgrounds, athletic fields, and intensive play areas	Paths and trails	Golf fairways
Moderate for slopes up to 12 percent and severe for slopes steeper than 12 percent; subject to blowing; droughty; hard to maintain vegetation; areas left bare are highly erodible; soils are sandy and lack a firm surface.	Severe: soils are sandy and lack a firm surface; subject to blowing; slopes; droughty; hard to maintain turf; areas left bare are highly erodible.	Moderate for slopes up to 12 percent and severe for slopes steeper than 12 percent; soils are sandy and lack a firm surface; subject to blowing; highly erodible.	Severe: slopes; droughty; hard to maintain turf.
Severe: seasonal water table near surface; subject to ponding; dries out slowly in spring; slippery and sticky when wet.	Severe: seasonal water table near surface; subject to ponding; dries out slowly in spring; slippery and sticky when wet.	Severe: seasonal water table near surface; subject to ponding; dries out slowly in spring; slippery and sticky when wet.	Severe: seasonal water table near surface; subject to ponding; dries out slowly in spring; turf easily damaged when wet.
Severe: seasonal water table near the surface; permeability; subject to ponding; dries slowly; slippery and sticky when wet; hard and rough when dry; turf easily damaged when wet.	Severe: seasonal water table near the surface; permeability; subject to ponding; dries slowly; slippery and sticky when wet; hard and rough when dry; turf easily damaged when wet.	Severe: seasonal water table near the surface; subject to ponding; permeability; slippery and sticky when wet; hard and rough when dry; dries slowly.	Severe: seasonal water table near the surface; permeability; subject to ponding; dries slowly; turf easily damaged when wet; slippery and sticky when wet; hard and rough when dry.
Moderate: subject to flooding.	Severe: subject to flooding.	Moderate: subject to flooding.	Moderate: subject to flooding.
Severe: subject to flooding; seasonal high water table; dries slowly in spring.	Severe: subject to flooding; seasonal high water table; dries slowly in spring.	Moderate: subject to flooding; seasonal high water table; dries slowly in spring.	Moderate: subject to flooding; seasonal high water table; dries slowly in spring.
Severe: subject to flooding; permeability; seasonal water table near the surface; slippery and sticky when wet; hard and rough when dry; dries slowly; difficult to drain.	Severe: subject to flooding; permeability; seasonal water table near the surface; slippery and sticky when wet; hard and rough when dry; turf easily damaged when wet; difficult to drain.	Severe: seasonal water table near the surface; permeability; dries slowly; subject to flooding; poor trafficability when wet.	Severe: permeability; seasonal water table near the surface; dries slowly; slippery and sticky when wet; hard and rough when dry; subject to flooding; turf easily damaged when wet; droughty in summer.
Severe: subject to flooding in most places; soil is sandy and lacks a firm surface; subject to blowing; droughty; hard to maintain vegetation.	Severe: subject to flooding in most places; subject to blowing; soil is sandy and lacks a firm surface; droughty; hard to maintain vegetation.	Severe: subject to flooding in most places; soil is sandy and lacks a firm surface; subject to blowing.	Severe: subject to flooding in most places; droughty; difficult to maintain turf; lacks a firm surface.
Very severe.	Very severe.	Very severe.	Very severe.

[4] The Beaucoup, Petrolia, and Sawmill soils are more permeable than other soils in this group and have better internal drainage once the water table is lowered, but they dry out sooner after a rain and are somewhat less restrictive for recreational use.

[5] The physical properties of the two soils in this group differ considerably, but the soils are grouped together because of their extreme wetness; at present these soils are not suitable for recreational use but may have value as wetland wildlife areas.

TABLE 6.—*Engineering*

[Tests performed by the Illinois Division of Highways, Bureau of Materials, Springfield, Ill., in cooperation with of State Highway

Soil name and location of sample	Parent material	Illinois report No.	Depth	Horizon	Moisture-density [1]	
					Maximum dry density	Optimum moisture
			Inches		*Lb. per cu. ft.*	*Percent*
Allison silty clay loam: T. 8 S., R. 10 E., sec. 25, NE160, SE40, NW10, SW2½; about 300 feet S. of field road along break to lower area, and about ¼ mile SE. from present bank of the Wabash River and 1 mile W. of its junction with the Ohio River. (Modal)	Alluvium.	65–4413	0–8	Ap	104	23
		65–4414	17–35	B21	105	19
Beaucoup silty clay loam: T. 9 S., R. 9 E., sec. 8, SE160, NW40; about 770 feet SE. of ½-mile line along road and 50 feet E. (Modal)	Alluvium.	65–4401	7–14	A1	104	18
		65–4402	28–40	B22g	108	20
		65–4403	55–70	C1	108	18
McGary silt loam: T. 8 S., R. 8 E., sec. 4, SE160, NE40, SW10; 200 feet W. of lane, 10 feet S. of woods. (Modal)	Alluvium.	65–4407	5–11	A2	110	17
		65–4408	25–29	B22t	110	19
		65–4409	46–57	C2	106	21
Montgomery silty clay: T. 9 S., R. 8 E., sec. 30, NE160, SW40, NE1; about 5 rods W. and 4 rods S. of road corner. (Modal)	Alluvium.	65–4398	0–13	Ap, A1	102	20
		65–4399	25–32	B22g	99	23
		65–4400	50–75	C1g	109	18
Reesville silt loam: T. 9 S., R. 8 E., sec. 2, NW160, NW40, SE10, SE2½; about 1,150 feet NW. of intersection and 2 rods S. of road. (Modal)	Loess or silty alluvium.	65–4392	0–6	Ap	106	17
		65–4393	14–23	B22t	103	22
		65–4394	35–45	C2	115	16
Shiloh silty clay: T. 8 S., R. 9 E., sec. 28, about 990 feet S. of NW. corner of the section and 2 rods E. of road on the south side of drainage ditch. (Modal)	Alluvium.	65–4410	8–17	A1	96	24
		65–4411	31–39	B22g	104	21
		65–4412	50–90	C1g	105	20
Uniontown silt loam: T. 9 S., R. 8 E., sec. 5, NE160, NE40, NE10, NE2½; under the south wire of power line, 30 feet W. of road center. (Solum is shallow to parent material)	Loess or silty alluvium.	65–4395	0–5	Ap	113	14
		65–4396	9–18	B2t	100	23
		65–4397	22–36	B3, C	119	14

[1] Based on AASHO Designation T–99–57, Method A (*1*).

[2] Mechanical analyses according to the AASHO Designation T–88. Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes

test data

the U.S. Department of Commerce, Bureau of Pubic Roads (BPR), in accordance with standard procedures of the American Association Officials (AASHO) (*1*)]

Mechanical analysis [2]								Liquid limit	Plasticity index	Classification	
Percentage passing sieve—				Percentage smaller than—						AASHO	Unified [3]
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
								Percent			
------	------	100	99	93	75	49	45	43	20	A-7-6(13)	CL
------	------	100	98	83	61	32	27	36	11	A-6(8)	ML-CL
------	100	99	68	66	59	49	47	38	20	A-6(12)	CL
------	100	99	69	67	59	42	39	45	25	A-7-6(15)	CL
------	100	97	67	66	60	47	45	41	27	A-7-6(15)	CL
------	100	97	92	88	67	31	26	28	8	A-4(8)	CL
------	100	99	95	91	80	49	45	41	22	A-7-6(13)	CL
------	100	99	96	92	81	57	51	44	24	A-7-6(14)	CL
------	100	98	95	90	60	41	38	41	16	A-7-6(11)	CL-ML
------	100	99	97	94	84	65	58	52	24	A-7-6(19)	CH-MH
[4] 99	98	96	93	91	82	57	51	46	26	A-7-6(15)	CL
------	100	98	93	84	71	13	11	23	2	A-4(8)	ML
------	100	99	96	91	73	41	39	42	19	A-7-6(12)	CL
[5] 98	97	95	93	86	66	24	18	31	10	A-6(8)	CL-ML
------	------	100	93	91	82	56	50	54	27	A-7-6(18)	CH-MH
------	100	99	92	88	70	39	33	44	21	A-7-6(13)	CL
------	100	99	95	87	67	37	30	43	20	A-7-6(12)	CL
------	100	99	95	85	46	15	11	23	5	A-4(8)	CL-ML
------	------	100	98	94	80	49	45	51	31	A-7-6(17)	CH-CL
[4] 98	97	94	90	83	45	20	18	26	7	A-4(8)	CL-ML

for soils.

[3] Based on the Unified Soil Classification System, Tech. Memo. No. 3-357 (*24*). SCS and BPR have agreed to consider that all soils having plasticity indexes within two points from A-line are to be given a borderline classification. Examples of borderline classifications obtained by this use are ML-CL and CH-CL.

[4] 100 percent passing 3-inch sieve.

[5] 100 percent passing ¾-inch sieve and 99 percent passing ⅜-inch sieve.

TABLE 7.—*Estimated*

[Absence of information in a column indicates

Soil series and map symbols	Depth to bedrock	Depth to seasonally high water table	Depth from surface [1]	Classification		
				USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
Alford (308B, 308C2, 308C3, 308D2, 308D3, 308E2, 308E3, 308F2, 308F3, 308G, 985D2). For properties of Bold soils in mapping unit 985D2, refer to the Bold series in this table).	8+	8+	0–7	Silt loam	ML	A–4
			7–43	Silty clay loam	CL	A–6 or A–7
			43–62	Silt loam	ML or CL	A–4 or A–6
Allison (306)	10+	3–5	0–70	Silty clay loam	CL or ML–CL	A–6 or A–7
Alvin (131A, 131B, 131C2, 131D3, 131E2)	10+	10+	0–17	Fine sandy loam	SM or ML	A–2 or A–4
			17–48	Sandy loam	SM or CL	A–4 or A–6
			48–62	Sandy loam	SM	A–2
			62–100	Sand	SP or SM	A–2 or A–3
Ava (14B, 14C, 14C2, 14D3)	6+	10+	0–8	Silt loam	ML or CL	A–4
			8–19	Silty clay loam	CL	A–6
			19–60	Clay loam	CL or ML–CL	A–6 or A–4
Beaucoup (70)	10+	0–4	0–55	Silty clay loam	CL	A–6 or A–7
Belknap (382)	½–5 +	1–3	0–16	Silt loam	ML or CL	A–4
			16–65	Stratified silt loam and loamy sand.	ML or SM	A–4
Berks (Mapped only in a complex with Wellston soils.)	0–2		0–14	Silt loam to loam	ML	A–4 or A–2
			14–40	Stony loam and stony silt loam.	GM	A–1–a or A–2
			40	Fractured sandstone bedrock.		
Birds (334)	10+	0–2	0–60	Silt loam	ML or CL	A–4 or A–6
Bloomfield (53C, 53E)	10+	10+	0–20	Fine sand	SP or SM	A–2 or A–3
			20–80	Stratified sandy loam.	SM or SC	A–2 or A–4
			20–80	Interstratified loamy sand.	SP or SM	A–2 or A–3
Bluford (13B, 13C2)	6+	1–3	0–17	Silt loam	ML or CL	A–4
			17–36	Silty clay loam	CL	A–7
			36–46	Silt loam	ML or CL	A–6 or A–7
Bold (Mapped only in a complex with Alford soils.)	10+	10+	0–60	Silt loam	ML	A–4
Bonnie (108)	[5] 3½–10+	0–3	0–60	Silt loam	ML or CL	A–4
Burnside (427)	1–3½		0–24	Silt loam	ML	A–4
			24–48	Cobblestone and other stones.	[6]	[6]
Camden (134A, 134B, 134C2, 134C3, 134D3)	10+	5–10	0–8	Silt loam	ML or CL	A–4 or A–6
			8–32	Silty clay loam to heavy loam.	CL	A–6 or A–7
			32–50	Sandy loam	SM or ML	A–4
Creal (337B)	10+	1–3	0–28	Silt loam	ML or CL	A–4
			28–43	Silty clay loam	CL	A–7
			43–60	Silt loam	ML or CL	A–6 or A–7
Darwin (71, 71+[7])	10+	0–2	0–16	Silty clay	CH	A–7
			16–50	Silty clay to clay	CH	A–7
Drury (75A, 75B)	10+	10+	0–55	Silt loam	ML or CL	A–4 or A–6

See footnotes at end of table.

properties of the soils

information was not available or does not apply]

Percentage passing sieve— No. 4	Percentage passing sieve— No. 10	Percentage passing sieve— No. 200	Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosion potential for metal conduits (untreated steel)
			Inches per hour	*Inches per inch of soil*	*pH*		
100	100	95–100	0.63–2.00	0.20–0.25	6.1–7.3	Low	
100	100	95–100	0.63–2.00	0.19–0.21	5.1–6.5	Moderate	Moderate.
100	100	95–100	0.63–2.00	0.18–0.23	[2] 5.1–8.4	Low to moderate	Variable.
100	100	90–100	0.63–2.00	0.19–0.23	6.1–7.8	Moderate	Moderate.
100	100	30–60	2.00–6.30	0.13–0.17	5.1–6.5	Low	
100	100	40–65	0.63–2.00	0.14–0.18	5.1–6.5	Low	Low.
100	100	10–30	6.30–20.0	0.08–0.10	5.1–7.3	Low	Low.
100	100	5–15	6.30–20.0	0.02–0.04	6.6–7.3	Low	
100	100	95–100	0.63–2.00	0.20–0.25	5.1–6.0	Low to moderate	
100	100	95–100	0.63–2.00	0.19–0.21	4.5–5.5	Moderate	Moderate.
95–100	95–100	50–80	0.06–0.20	[3] 0.16–0.19	4.5–5.5	Moderate	Moderate.
100	100	65–75	0.63–2.00	0.19–0.23	6.1–7.8	Moderate to high	High.
100	95–100	70–95	0.20–0.63	0.20–0.25	5.1–6.0	Low to moderate	High.
100	95–100	40–90	0.20–2.00	0.19–0.21	5.1–6.0	Low	High.
40–90	25–60	15–55	0.63–2.00	0.19–0.23	4.0–5.0	Low	
20–40	5–25	0–15	0.63–2.00	0.10–0.12	4.0–5.0	Low	Low.
100	100	90–100	0.06–0.20	0.18–0.21	5.6–7.3	Low to moderate	High.
100	100	5–35	6.30–20.0	0.04–0.06	5.6–6.5	Low	
100	100	25–45	2.00–6.30	0.10–0.12	5.6–6.5	Low	Low.
100	100	5–35	6.30–20.0	0.04–0.08	5.6–6.5	Low	Low.
100	95–100	95–100	0.63–2.00	0.20–0.23	5.1–6.0	Low to moderate	
100	95–100	90–100	0.06–0.20	0.19–0.21	4.0–5.5	Moderate	High.
100	90–100	80–95	0.20–0.63	0.16–0.19	4.0–6.0	Moderate	High.
100	100	95–100	0.63–2.00	0.16–0.18	[2] 7.4–8.4	Low	Low.
100	100	90–100	0.06–0.20	0.18–0.21	4.5–6.0	Low to moderate	High.
100	80–100	60–95	0.63–2.00	0.20–0.25	5.1–6.0	Low	High.
10–60	10–30	5–20	([6])				
100	95–100	80–95	0.63–2.00	0.20–0.25	5.6–6.5	Low to moderate	
95–100	90–100	60–90	0.63–2.00	0.18–0.20	5.6–6.5	Moderate	Moderate.
90–100	80–95	40–80	0.63–2.00	0.12–0.14	[2] 6.5–8.4	Low	Moderate.
100	95–100	95–100	0.63–2.00	0.20–0.25	5.1–6.0	Low to moderate	
100	95–100	95–100	0.06–0.20	0.19–0.21	4.5–5.5	Moderate to high	High.
100	95–100	95–100	0.20–0.63	0.18–0.23	4.5–5.5	Low to moderate	High.
100	100	95–100	0.06–0.20	0.16–0.18	6.1–6.5	High	
100	100	95–100	<0.06	0.14–0.16	6.1–7.8	High	High.
100	100	95–100	0.63–2.00	0.18–0.23	5.6–7.3	Low to moderate	Moderate.

297-851—69——8

TABLE 7.—*Estimated*

Soil series and map symbols	Depth to bedrock	Depth to seasonally high water table	Depth from surface[1]	Classification		
				USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
Dupo (180)	10+	1-3	0-28	Silt loam	ML or CL	A-4 or A-6
			28-52	Silty clay loam to silty clay.	CL or CH	A-6 or A-7
Emma (469A, 469B, 469D2)	10+	3-5	0-72	Silty clay loam	CL	A-6
Harco (484)	10+	3-5	0-17	Silt loam	ML or CL	A-4 or A-6
			17-39	Silty clay loam	CL	A-6 or A-7
			39-61	Silt loam	ML or CL	A-4 or A-6
Harpster (67)	10+	0-1	0-70	Silty clay loam	CL or CH	A-6 or A-7-6
Haymond (331)	10+	5-10	0-50	Silt loam	ML	A-4
Hickory (8C2, 8D3, 8E3, 8F2)	5+	5+	0-4	Loam	ML or CL	A-4 or A-6
			4-43	Clay loam to silty clay loam.	CL	A-6 or A-7
			43-49	Loan	ML or CL	A-4 or A-6
Hosmer (214B, 214C, 214C2, 214C3, 214D, 214D2, 214D3, 214E2, 214E3).	[8] 6-12	5-10	0-23	Silt loam	ML	A-4
			23-34	Silt loam to silty clay loam.	CL	A-6 or A-7
			34-79	Silt loam	ML or CL	A-4 or A-6
			79-90	Silt loam	ML	A-4 or A-6
Iva (454B)	10+	3-5	0-12	Silt loam	ML	A-4
			12-33	Silty clay loam	CL	A-7-6
			33-50	Silt loam	ML or CL	A-4 or A-6
Jules (28)	10+	5-10	0-45	Silt loam	ML or CL	A-4 or A-6
Karnak (426, W426)	10+	0-3	0-48	Silty clay	CH	A-7
Lamont (175B, 175C, 175D2)	10+	10+	0-21	Fine sandy loam, loamy sand, and loamy fine sand.	SM or ML	A-2 or A-4
			21-36	Fine sandy loam	ML or ML-CL	A-4
			36-60	Fine sand	SM	A-2 or A-4
			60-80	Fine sand	SM	A-2 or A-4
Marissa (176)	10+	3-5	0-18	Silt loam	ML or CL	A-4
			18-43	Silty clay loam	CL	A-6 or A-7
			43-56	Silt loam	ML or CL	A-4 or A-6
Markland (467B, 467B2, 467C2, 467C3, 467D2, 467E).	10+	5-10	0-11	Silt loam	ML	A-4
			11-39	Silty clay	CH or CL	A-7-6
			39-48	Silty clay	CH or CL	A-7-6
McGary (173A, 173B, 173B2, 173C2)	10+	1-3	0-11	Silt loam	CL or ML-CL	A-4 or A-6
			11-36	Silty clay	CL or CH	A-7-6
			36-60	Silty clay to clay	CL or CH	A-7-6
Montgomery (465, 465+)	10+	0-3	0-13	Silty clay	CL or ML	A-7-6
			13-50	Silty clay	CH-MH	A-7-6
			50-75	Silty clay	CL or CH	A-7-6
+Okaw (84)	10+	0-1	0-9	Silt loam	ML	A-4
			9-48	Silty clay to clay	CH	A-7-6 or A-7-5
			40-80	Silty clay loam to silty clay.	CL or CH	A-6 or A-7-6
+Onarga (190B, 190C)	10+	5+	0-18	Fine sandy loam	ML or SM	A-2 or A-4
			18-32	Sandy clay loam and sandy loam.	SM or SC	A-4 or A-6
			32-80	Fine sand to sand	SP or SM	A-2 or A-3

See footnotes at end of table.

properties of the soils—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosion potential for metal conduits (untreated steel)
No. 4	No. 10	No. 200					
			Inches per hour	*Inches per inch of soil*	*pH*		
100	100	95–100	0. 63–2. 00	0. 20–0. 25	5. 6–6. 5	Low to moderate	
100	100	95–100	0. 20–0. 63	0. 18–0. 20	5. 6–7. 3	Moderate to high	High.
100	100	95–100	0. 06–0. 63	0. 19–0. 21	4. 5–5. 5	Moderate	High.
100	100	95–100	0. 63–2. 00	0. 20–0. 25	6. 1–7. 3	Low to moderate	
100	100	95–100	0. 20–2. 00	0. 19–0. 21	6. 1–7. 3	Moderate	High.
100	100	95–100	0. 63–2. 00	0. 18–0. 23	[2] 7. 4–8. 4	Low to moderate	High.
100	100	95–100	0. 20–0. 63	0. 19–0. 21	[2] 7. 4–8. 4	Moderate to high	High.
100	100	95–100	0. 63. 2. 00	0. 20–0. 25	6. 1–7. 8	Low	Low.
95–100	90–100	50–80	0. 63–2. 00	0. 16–0. 20	4. 5–5. 5	Low to moderate	
95–100	90–100	55–85	0. 63–2. 00	0. 16–0. 19	4. 5–6. 0	Moderate	Moderate.
95–100	90–100	50–80	0. 20–2. 00	0. 14–0. 18	5. 5–6. 5	Low to moderate	Moderate.
100	100	90–100	0. 63–2. 00	0. 20–0. 25	5. 5–6. 0	Low	
100	100	90–100	0. 63–2. 00	0. 19–0. 21	4. 5–5. 5	Moderate	Moderate.
100	100	90–100	0. 06–0. 20	[3] 0. 17–0. 19	4. 5–5. 5	Moderate	Moderate.
100	100	70–100	0. 20–2. 00	[3] 0. 17–0. 19	4. 5–5. 5	Low to moderate	
100	100	90–100	0. 63–2. 00	0. 20–0. 25	5. 1–5. 5	Low	
100	100	90–100	0. 20–0. 63	0. 19–0. 21	5. 1–5. 5	Moderate to high	High.
100	100	90–100	0. 63–2. 00	0. 18–0. 23	5. 5–7. 3	Low to moderate	High.
100	100	90–100	0. 63–2. 00	0. 19–0. 21	[2] 7. 4–8. 4	Low	High.
100	100	95–100	<0. 20	0. 15–0. 18	5. 1–7. 3	High	High.
100	100	25–60	2. 00–6. 30	0. 15–0. 17	5. 5–6. 0	Low	
100	100	55–75	0. 63–2. 00	0. 13–0. 15	5. 5–6. 0	Low	Low.
100	100	15–45	6. 30–20. 0	0. 16–0. 08	5. 5–7. 3	Low	Low.
100	100	15–45	6. 30–20. 0	0. 06–0. 08	[2] 7. 4–8. 4	Low	Low.
100	100	90–100	0. 63–2. 00	0. 20–0. 25	6. 1–7. 3	Moderate	
100	100	95–100	0. 20–0. 63	0. 19–0. 21	6. 1–7. 3	Moderate	High.
100	100	90–100	0. 63–2. 00	0. 18–0. 23	[9] 6. 6–7. 8	Low to moderate	High.
100	100	90–100	0. 63–2. 00	0. 20–0. 25	4. 5–5. 5	Low	
100	100	90–100	<0. 20	0. 15–0. 18	4. 5–5. 5	High	High.
100	100	90–100	<0. 20	0. 15–0. 18	[2] 7. 4–8. 4	High	High.
100	100	90–100	0. 63–2. 00	0. 20–0. 25	5. 1–6. 6	Low	
100	100	90–100	<0. 20	[3] 0. 15–0. 18	5. 1–7. 3	High	High.
100	100	90–100	<0. 20	[3] 0. 15–0. 18	[2] 7. 4–8. 4	High	High.
100	100	90–100	0. 63–0. 20	0. 16–0. 20	6. 5–7. 3	High	High.
100	100	90–100	0. 06–0. 20	0. 16–0. 19	6. 5–7. 3	High	High.
95–100	95–100	90–95	0. 06–0. 20	0. 16–0. 19	[2] 7. 4–8. 4	High	High.
100	100	95–100	0. 20–0. 63	0. 20–0. 25	4. 5–5. 5	Low to moderate	
100	100	95–100	<0. 06	[3] 0. 15–0. 18	4. 5–6. 0	High	High.
100	100	95–100	<0. 06	[3] 0. 15–0. 18	[10] 6. 6–8. 4	High	High.
100	95–100	30–60	0. 63–2. 00	0. 13–0. 17	5. 6–6. 5	Low to moderate	
100	95–100	40–50	0. 63–2. 00	0. 14–0. 18	5. 6–6. 5	Moderate	Moderate.
100	95–100	0–20	6. 30–20. 0	0. 02–0. 04	6. 1–7. 3	Low	Low.

TABLE 7.—*Estimated*

Soil series and map symbols	Depth to bedrock	Depth to seasonally high water table	Depth from surface[1]	Classification		
				USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
Patton (142)	10+	0–3	0–48	Silty clay loam	CL	A–6
			48–54	Silty clay loam or silt loam.	CL	A–6
Petrolia (288)	10+	0–3	0–55	Silty clay loam	CL	A–6 or A–7
Piopolis (420)	10+	0–3	0–45	Silty clay loam	CL	A–6
Plano (199A, 199B)	10+	5–10	0–20	Silt loam	ML or CL	A–4 or A–6
			20–56	Silty clay loam	CL	A–6
			56–62	Sandy loam	SM	A–2
Racoon (109)	10+	0–1	0–30	Silt loam	ML	A–4
			30–44	Silty clay loam	CL	A–6
			44–60	Stratified silt loam and silty clay loam.	ML or CL	A–4 or A–6
Reesville (723A, 723B, 723B2, 723C2, 723C3)	10+	3–5	0–8	Silt loam	ML	A–4
			8–29	Silty clay loam	CL	A–7 or A–6
			29–45	Silt loam	CL–ML	A–6
Roby (184A, 184B)	10+	1–3	0–16	Fine sandy loam	SM or ML	A–4
			16–47	Sandy clay loam to clay loam.	SC or CL	A–4 or A–6
			47–50	Stratified fine sand, fine sandy loam, and clay loam.	SM	A–2 or A–4
Ruark (178)	10+	0–1	0–13	Fine sandy loam	SM or ML	A–4
			13–46	Sandy clay to clay loam.	CL	A–4 or A–6
			46–60	Sandy clay loam to sand.	(6)	(6)
Sarpy (92)	10+	5+	0–60	Sand to loamy fine sand.	SP or SW	A–1–b or A–3
Sawmill (107)	10+	0–1	0–60	Silty clay loam	CL, CH, or MH	A–7
			60–72	Silt loam	ML or CL	A–4 or A–6
Sciotoville (462A, 462B, 462C2, 462D2, 462E2)	10+	3–5	0–9	Silt loam	ML	A–4
			9–52	Silty clay loam	CL	A–6 or A–7
Sexton (208)	10+	0–1	0–23	Silt loam	ML	A–4
			23–48	Silty clay loam	CL or CH	A–7
			48–69	Gritty silt loam that grades to loam.	ML or SM	A–4
Shiloh (138)	10+	0–1	0–17	Silty clay	CH–MH	A–7–6
			17–90	Silty clay to clay	CL or CH	A–7–6
			90–96	Fine sand, sandy loam, and sandy clay loam; stratified.	(6)	(6)
Starks (132A, 132B)	10+	1–3	0–11	Silt loam	ML	A–4
			11–30	Silty clay loam to sandy clay loam.	CL	A–6
			30–40	Sandy loam	SM	A–2
			40–60	Stratified loamy sand, sandy loam, and loam.	SM	A–2

See footnotes at end of table.

properties of the soils—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosion potential for metal conduits (untreated steel)
No. 4	No. 10	No. 200					
			Inches per hour	*Inches per inch of soil*	*pH*		
100	100	95–100	0. 63–2. 00	0. 19–0. 23	6. 1–7. 8	Moderate	High.
100	100	90–100	0. 63–2. 00	0. 19–0. 21	[2] 7. 4–8. 4	Moderate	High.
100	100	95–100	0. 20–0. 63	0. 19–0. 23	5. 6–7. 3	Moderate	High.
100	100	95–100	0. 06–0. 20	0. 18–0. 20	5. 1–5. 6	Moderate	High.
100	100	90–100	0. 63–2. 00	0. 20–0. 25	5. 6–6. 5	Low to moderate	
100	100	90–100	0. 63–2. 00	0. 19–0. 21	5. 6–6. 5	Moderate	Moderate.
100	90–100	25–35	0. 63–6. 30	0. 10–0. 12	6. 1–6. 5	Low	Low.
100	100	85–100	0. 20–0. 63	0. 18–0. 23	4. 5–6. 0	Low	
100	100	85–100	<0. 20	0. 16–0. 19	4. 5–6. 0	Moderate	High.
100	100	85–100	0. 63–2. 00	0. 19–0. 21	[11] 6. 1–8. 4	Low to moderate	High.
100	100	90–95	0. 63–2. 00	0. 20–0. 25	5. 6–6. 5	Low	
100	100	95–100	0. 20–2. 00	0. 19–0. 21	6. 1–7. 3	Moderate	High.
100	95–100	90–95	0. 63–2. 00	0. 18–0. 23	[2] 7. 4–8. 4	Low to moderate	High.
100	100	40–60	0. 63–2. 00	0. 13–0. 17	5. 1–6. 0	Low	
100	100	40–80	0. 20–0. 63	0. 14–0. 18	4. 5–6. 0	Moderate	High.
100	100	15–50	6. 30–20. 0	0. 06–0. 08	4. 5–6. 0	Low	Moderate.
100	100	40–60	2. 00–6. 30	0. 13–0. 17	5. 1–5. 5	Low	
100	100	55–85	0. 06–0. 20	0. 16–0. 18	4. 5–5. 0	Moderate	High.
100	(6)	(6)	(6)	(6)	5. 1–7. 3	Low to moderate	High.
100	40–80	0–10	6. 30–20. 0	0. 06–0. 08	[2] 7. 4–8. 4	Low	Low.
100	100	90–100	0. 20–0. 63	0. 19–0. 23	6. 1–7. 3	High	High.
100	95–100	90–100	0. 63–2. 00	0. 19–0. 21	6. 1–7. 3	Low to moderate	High.
100	100	90–100	0. 63–2. 00	0. 18–0. 23	5. 1–5. 5	Low	
100	100	90–100	0. 20–0. 63	0. 18–0. 20	4. 5–5. 5	Moderate	High.
100	100	90–100	0. 20–0. 63	0. 20–0. 25	5. 6–6. 5	Low to moderate	
100	100	90–100	0. 06–0. 20	0. 19–0. 21	4. 5–6. 0	High	High.
100	95–100	40–80	2. 00–6. 30	0. 16–0. 18	6. 1–7. 3	Low to moderate	High.
100	100	90–95	0. 20–0. 63	0. 16–0. 19	6. 1–7. 3	High	
100	100	90–95	0. 06–0. 63	0. 15–0. 18	[2] 7. 4–8. 4	High	High.
100	(6)	(6)	(6)	(6)	[2] 7. 4–8. 4		
100	100	95–100	0. 63–2. 00	0. 20–0. 25	6. 1–6. 5	Low	
100	100	50–80	0. 20–0. 63	0. 16–0. 19	5. 6–6. 5	Moderate	High.
100	100	25–35	0. 63–2. 00	0. 12–0. 14	6. 1–7. 3	Low	Moderate.
100	100	15–35	2. 00–6. 30	0. 06–0. 08	6. 6–7. 8	Low	Moderate.

TABLE 7.—*Estimated*

Soil series and map symbols	Depth to bedrock	Depth to seasonally high water table	Depth from surface [1]	Classification		
				USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
Stoy (164A, 164B)	7+	1–3	0–13	Silt loam	ML or CL	A–4 or A–6
			13–36	Silty clay loam	CL	A–6 or A–7
			36–45	Silty clay loam	CL	A–6
			45–65	Silt loam	ML	A–4 or A–6
Tice (284)	10+	1–3	0–70	Silty clay loam	CL or CH	A–6 or A–7
Uniontown (482A, 482B, 482C2, 482C3, 482D2, 482E3).	10+	5+	0–5	Silt loam	CL–ML	A–4
			5–30	Silty clay loam	CH–CL	A–6 or A–7
			30	Silt loam stratified with silty clay loam.	CL–ML	A–4
Wabash (83)	10+	0–1	0–8	Silty clay	CH	A–7
			8–50	Silty clay to clay	CH	A–7
Wakeland (333)	5+	1–3	0–35	Silt loam	ML	A–4
			35–60	Stratified loam, silt loam, and sandy loam.	ML or SM	A–2 or A–4
Wallkill (W464)	10+	[13]0–1	0–22	Silty clay loam	CL or CH	A–7
			22–45	Peat or muck	Pt	([14])
			45	Clay loam	CL	A–7
Weinbach (461A, 461B)	10+	1–3	0–23	Silt loam	ML	A–4
			23–45	Silty clay loam	CL	A–6
			45–70	Stratified silty clay loam, sandy clay loam, and sandy loam.	CL, SC, or SM	A–6 or A–4
Weir (Mapped only in an undifferentiated unit with Wynoose soils.)	7+	0–1	0–20	Silt loam	ML	A–4
			20–42	Silty clay loam to silty clay.	CL or CH	A–6 or A–7
			42–50	Silt loam	ML or CL	A–4 or A–6
Wellston (339D2, 339E2, 339E3, 339F2, 986F2). (For properties of the Berks soil in mapping unit 986F2, refer to the Berks series in this table.	3–5		0–7	Silt loam	ML	A–4
			7–32	Silty clay loam	CL	A–4 or A–6
			32	Bedrock.		
Worthen (37)	10+	5–10	0–60	Silt loam	ML or CL	A–4 or A–6
Wynoose (12)	10+	0–1	0–16	Silt loam	ML–CL	A–4
			16–39	Silty clay loam to silty clay.	CL or CH	A–6 or A–7
			39–50	Silt loam to silty clay loam.	CL	A–6
Zanesville (340D2, 340E2, 340E3, 340F2)	1½–3½		0–13	Silt loam	ML	A–4
			13–26	Silty clay loam	CL	A–6
			26–37	Silt loam to loam	ML	A–4
			37–60	Bedrock.		

[1] Depth and thickness representative of soil that is not severely eroded; severely eroded soils, or soils that have a "3" in the mapping unit symbol, have lost most of their surface layer; in such soils the second layer listed is at or near the surface and subsequent layers are correspondingly nearer to the surface.
[2] Calcareous.
[3] Root penetration is restricted at this depth, and thus plants cannot use all of the moisture available.
[4] Minimum depth to bedrock is 3½ feet, but in most places the depth is more than 5 feet.
[5] Minimum depth to bedrock is 3½ feet, but in most places the depth is more than 10 feet.
[6] Variable.
[7] Mapping unit 71+ has about 10 to 30 inches of silt loam overwash on top of the material described.
[8] Average.

properties of the soils—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosion potential for metal conduits (untreated steel)
No. 4	No. 10	No. 200					
			Inches per hour	*Inches per inch of soil*	*pH*		
100	100	95–100	0.20–0.63	0.20–0.25	4.5–5.5	Low to moderate	
100	100	95–100	0.06–0.20	0.15–0.18	4.5–5.5	Moderate to high	High.
100	100	95–100	0.06–0.20	0.15–0.18	4.5–5.5	Moderate	High.
100	95–100	90–100	0.20–0.63	0.18–0.20	4.5–5.5	Low to moderate	High.
100	100	90–100	0.20–2.00	0.19–0.23	6.1–7.3	Moderate to high	High.
100	100	90–100	0.63–2.00	0.20–0.25	6.1–7.3	Low	
100	100	95–100	0.63–2.00	0.19–0.21	[2] 5.1–7.8	Moderate to high	Moderate.
100	100	95–100	0.63–0.20	0.16–0.19	[2] 7.4–8.4	Low	Moderate.
100	100	95–100	0.06–0.20	0.16–0.19	[12] 6.1–6.5	High	
100	100	90–100	<0.20	[3] 0.15–0.18	6.1–8.4	High	High.
100	100	80–100	0.63–2.00	0.20–0.25	5.6–7.3	Low	High.
100	90–100	30–80	0.63–6.30	0.12–0.18	6.1–7.3	Low	High.
100	100	95–100	0.20–0.63	0.19–0.21	5.6–7.3	High	High.
(14)	(14)	(14)	6.30–20.0	>0.25	5.6–6.0	Low [15]	High.
100	100	70–80	0.06–0.20	0.16–0.19	6.6–7.3	High	High.
100	100	90–100	0.63–2.00	0.19–0.23	4.5–5.5	Low	
100	100	90–100	0.06–0.20	0.19–0.21	4.5–5.5	Moderate	High.
100	100	35–90	0.20–2.00	0.12–0.17	6.1–7.3	(6)	(6)
100	100	95–100	0.20–0.63	0.20–0.25	4.5–6.0	Low	
100	100	95–100	0.06–0.20	0.16–0.19	4.5–5.0	High	High.
100	100	95–100	0.20–0.63	0.18–0.23	4.5–6.0	Low to moderate	High.
100	100	95–100	0.63–2.00	0.20–0.25	4.5–5.5	Low	
100	100	80–100	0.63–2.00	0.19–0.21	4.5–5.5	Moderate	Moderate.
100	100	90–100	0.63–2.00	0.20–0.25	6.1–7.3	Low to moderate	Moderate.
100	100	95–100	0.20–0.63	0.20–0.25	4.5–6.0	Low	
100	100	95–100	<0.06	0.15–0.18	4.5–5.5	High	High.
100	100	60–90	0.20–0.63	[3] 0.18–0.20	4.5–6.0	Moderate	High.
100	100	95–100	0.63–2.00	0.20–0.25	4.0–5.0	Low	
100	100	95–100	0.20–0.63	0.19–0.21	4.5–5.5	Moderate	Moderate.
100	95–100	90–100	<0.06	0.14–0.18	4.5–5.5	Low	Moderate.

[9] Calcareous in some places.
[10] Calcareous below a depth of 6 feet.
[11] Generally noncalcareous.
[12] In some areas Wabash silty clay is calcareous throughout; these calcareous areas are shown on the detailed soil map by a spot symbol.
[13] Ponded in places.
[14] Organic material.
[15] Not suitable as foundation material for buildings or roads; the skrink-swell potential is low because of lack of clay; the volume change is very high under a load or if water is removed because of subsidence and because the organic material in this layer is highly unstable.

TABLE 8.—*Engineering*

Soil series and map symbol	Suitability as a source of—			Soil features affecting suitability for—	
	Topsoil	Sand or gravel	Highway subgrade material	Highway location	Farm ponds: Reservoir area
Alford (308B, 308C2, 308C3, 308D2, 308D3, 308E2, 308E3, 308F2, 308F3, 308G, 985D2). (For properties of Bold soil in mapping unit 985D2, refer to the Bold series in this table.)	Good in surface layer unless eroded.	Not suitable	Poor to fair; compaction, stability, shear strength, and bearing capacity are poor to fair.	Deep loess; unstable when wet; highly susceptible to frost heaving; hilly; cuts and fills needed.	Moderate seepage; moderately permeable material.
Allison (306)	Fair because material is somewhat clayey.	Not suitable	Poor; moderate volume change; fair to poor bearing capacity; difficult to compact.	Subject to overflow if not protected by levees; seasonal high water table.	On bottom lands generally not used for farm ponds.
Alvin (131A, 131B, 131C2, 131D3, 131E2).	Fair in surface layer; somewhat sandy.	Good as source of sand below a depth of 3 feet or more; generally poorly graded; contains fines in some places.	Fair to poor in subsoil, because of fair bearing capacity and shear strength; fair to good in substratum.	Exposed sand is highly erodible; moderate susceptibility to frost heaving in upper 3 feet or more.	Underlain by sand at a depth between 3 and 5 feet; seepage excessive.
Ava (14B, 14C, 14C2, 14D3).	Fair in surface layer.	Not suitable	Poor to fair in subsoil, poor in substratum; fair to poor bearing capacity and shear strength.	Plastic clay loam glacial till at a depth of 1½ to 3 feet; seepage common in spring at a depth of 1½ to 3 feet.	Impervious material; holds water.
Beaucoup (70)	Fair in surface layer; clayey; on flood plain.	Not suitable	Poor; on flood plains; seasonal high water table; poor to fair compaction, stability, bearing capacity, and shear strength; high compressibility.	High water table; subject to flooding; high susceptibility to frost heaving; plastic material.	On bottom lands; in places is underlain by more permeable material.
Belknap (382)	Good in surface layer; on flood plain.	Not suitable	Poor to fair; stratified material; high water table; fair to poor stability, compaction, bearing capacity, and shear strength.	High water table; subject to flooding; high susceptibility to frost heaving; seepage likely in cuts.	On bottom lands; moderate seepage.
Berks (Mapped only in a complex with the Wellston soils.)	Poor because of too many stones.	Not suitable	Fair to good in subsoil, though subsoil is thin.	Shallow to bedrock; highly erodible.	Not suitable; steep slopes; shallow to bedrock.

interpretations

Soil features affecting suitability for—Continued					Limitation for use as disposal field for septic tanks
Farm Ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Poor stability; poor resistance to piping in subsoil and substratum.	Not needed; natural drainage adequate.	High water-holding capacity; moderate to slow intake rate; many areas sloping; other characteristics favorable.	No major construction problems if topography is favorable.	No major construction problems; difficult to establish vegetation on steep slopes.	Slight on 1 to 4 percent slopes; moderate on 4 to 12 percent slopes, and severe on 12 to 60 percent slopes; moderate permeability.
Fair stability and compaction.	Not needed; natural drainage adequate; subject to flooding if not protected.	High water-holding capacity; moderate intake rate.	Not needed because of topography.	Seldom used; no major construction problems.	Severe; subject to flooding.
Fair stability in subsoil; rapid permeability in substratum.	Not needed; natural drainage adequate.	Low water-holding capacity; moderate intake rate; sand at a depth below 3 feet.	Sandy substratum is highly erodible if exposed; difficult to obtain good crop growth.	Sandy substratum is highly erodible if exposed; difficult to vegetate.	Slight on 0 to 4 percent slopes, moderate on 4 to 12 percent slopes, and severe on 12 to 30 percent slopes; nearby water supplies are subject to pollution because of rapid permeability of underlying sand.
Fair to good stability and compaction characteristics in subsoil and substratum.	Not needed; natural drainage adequate.	Moderate water-holding capacity; moderate to slow intake rate.	No major construction problems if topography is favorable.	No major construction problems; fertility is low and fertilizer is required to establish vegetation.	Severe; slow permeability in fragipan; seepage on slopes.
Fair stability; high compressibility.	Moderate permeability; subject to overflow unless protected; tile and open ditches needed for drainage.	High water-holding capacity; moderate to slow intake rate; subject to flooding in places; other characteristics favorable.	Not needed	Not needed; no major construction problems.	Severe; high water table; subject to flooding.
Poor stability, compaction characteristics, and resistance to piping.	Moderately slow permeability; subject to flooding unless protected; tile and open ditches needed for drainage.	High water-holding capacity; moderate to slow intake rate in places; subject to flooding; other characteristics favorable.	Not needed	Generally not needed; no major construction problems.	Severe; seasonal high water table; subject to occasional flooding; moderately slow permeability.
Not suitable; shallow to fractured rock.	Not needed; natural drainage adequate.	Not suitable; areas not used for farming.	Not suitable, because of steep slopes.	Highly erodible and droughty; shallow to bedrock; low fertility; difficult to vegetate.	Severe; shallow to bedrock; steep slopes.

TABLE 8.—*Engineering*

Soil series and map symbol	Suitability as a source of—			Soil features affecting suitability for—	
	Topsoil	Sand or gravel	Highway subgrade material	Highway location	Farm ponds: Reservoir area
Birds (334)	Fair to poor in surface layer; on flood plains and likely to be wet in spring.	Not suitable	Poor to fair; on flood plains; high water table; poor to fair compaction, stability, bearing capacity, and shear strength.	Seasonal high water table; subject to flooding; high susceptibility to frost heaving; seepage likely in cuts.	On bottom lands; slight seepage.
Bloomfield (53C, 53E)	Poor; sandy; low in organic matter; very low water-holding capacity; subject to blowing.	Good to fair as a source of sand; generally poorly graded; layers of finer textured material below a depth of 40 inches.	Fair to good below a depth of 8 to 12 inches; fair to good compaction, bearing capacity, and shear strength.	Sandy material; highly erodible; hinders hauling; cuts and fills needed.	Underlain by sand; seepage excessive.
Bluford (13B, 13C2)	Fair in surface layer.	Not suitable	Poor to fair; high water table; fair to poor compaction, stability, shear strength, and bearing capacity.	High susceptibility to frost heaving; seasonal high water table; plastic material.	Slight seepage; sites generally favorable.
Bold (Mapped only in a complex with Alford soils.)	Poor to fair; surface layer is thin, calcareous loess that is low in organic matter and erodes readily.	Not suitable	Poor; calcareous loess; unstable when wet; poor compaction, shear strength, and bearing capacity.	High susceptibility to frost heaving; underlain by deep loess; unstable when wet; slopes unstable; highly erodible.	Not suitable, because of slopes.
Bonnie (108)	Fair to poor in surface layer; generally wet in spring.	Not suitable	Poor to fair; on flood plains; high water table; poor compaction, stability, shear strength, and bearing capacity.	Seasonal high water table; subject to flooding in places; high susceptibility to frost heaving; seepage likely in cuts.	On bottom lands; slight seepage.
Burnside (427)	Poor; contains stones; most areas are small and wooded.	Not suitable	Poor; shallow to bedrock.	Shallow to bedrock; seepage at bedrock.	Shallow to bedrock.
Camden (134A, 134B, 134C2, 134C3, 134D3.)	Good in surface layer; in eroded areas surface layer is thin.	Generally not suited; in places stratified sand and gravel are below a depth of 5 feet.	Fair in subsoil; fair to good in substratum.	Moderate to high susceptibility to frost heaving.	Moderate seepage; underlain by sandy material.

interpretations—Continued

Soil features affecting suitability for—Continued					Limitation for use as disposal field for septic tanks
Farm Ponds—Con.: Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Poor stability; poor to fair compaction characteristics.	Slow permeability; subject to flooding unless protected; drainage needed; open ditches best suited.	High water-holding capacity; slow intake rate; slow permeability; subject to flooding.	Not needed	No major construction problems.	Severe; high water table; subject to flooding; slow permeability.
Rapid permeability; subject to piping.	Not needed; natural drainage adequate.	Low water-holding capacity; rapid intake rate.	Not suitable; deep sand.	Deep sand; highly erodible; difficult to vegetate.	Moderate to severe; nearby water supplies subject to pollution because of rapid permeability; seepage likely downslope; difficult to install and maintain filter fields.
Good to fair resistance to piping.	Slow permeability; drainage needed in some places; open ditches best suited.	Slow permeability; high water-holding capacity; moderate to slow intake rate; some areas are sloping; other characteristics favorable.	No major construction problems if topography is favorable.	No major construction problems; exposed subsoil is low in fertility.	Severe; seasonal high water table; slow permeability.
Moderate permeability; moderate to high seepage; low resistance to piping; poor stability and compaction.	Not needed; natural drainage adequate.	High water-holding capacity; moderate intake rate; moderate permeability.	No major construction problems if topography is favorable; highly erodible.	No major construction problems; highly erodible.	Moderate to severe because of slopes.
Poor stability; poor to fair compaction characteristics.	Slow permeability; subject to overflow unless protected; drainage needed; open ditches best suited.	High water-holding capacity; slow intake rate; slowly permeable; subject to flooding.	Not needed	No major construction problems.	Severe; high water table; subject to flooding; slow permeability.
Shallow to bedrock	Generally not needed.	Moderate permeability; moderate water-holding capacity; low to moderate intake rate.	Not needed	Not needed	Severe; seasonally high water table; shallow to bedrock; subject to occasional flooding.
Moderate to rapid seepage; sandy material; poor resistance to piping.	Not needed; natural drainage adequate.	High water-holding capacity; moderate intake rate; some areas are sloping.	No major construction problems if topography is favorable.	No major construction problems.	Slight on 0 to 4 percent slopes, moderate on 4 to 20 percent slopes; nearby water supplies may become polluted because of rapid permeability of substratum.

TABLE 8.—*Engineering*

Soil series and map symbol	Suitability as a source of—			Soil features affecting suitability for—	
	Topsoil	Sand or gravel	Highway subgrade material	Highway location	Farm ponds
					Reservoir area
Creal (337B)	Fair in surface layer.	Not suitable	Poor to fair; seasonal high water table; poor to fair compaction, stability, shear strength, and bearing capacity.	High susceptibility to frost heaving; seasonal high water table.	Slight seepage; sites generally favorable.
Darwin (71, 71+)	Poor; dense, clayey, and generally wet in spring; the mapping unit 71+ is somewhat better suited than mapping unit 71 because it has an overwash layer of silt loam.	Not suitable	Poor; on flood plains; high water table; clayey; unstable on slopes; high compressibility and shrink-swell potential.	Water table high in places; slopes tend to slump; high susceptibility to frost heaving; all layers plastic when wet.	On bottom lands; water table generally is high.
Drury (75A, 75B)	Good in surface layer.	Not suitable	Fair to poor; compaction, stability, shear strength, and bearing capacity are fair to poor.	High susceptibility to frost heaving; poor stability.	Moderate seepage
Dupo (180)	Good in surface layer; on flood plains.	Not suitable	Poor to fair; on flood plains; seasonal high water table; high compressibility; moderate to high shrink-swell potential; fair to poor compaction, stability, shear strength, and bearing capacity.	High susceptibility to frost heaving; poor stability; seasonal high water table; subject to flooding.	Seasonal high water table; material below surface layer is highly plastic and difficult to excavate.
Emma (469A, 469B, 469D2).	Poor; somewhat clayey.	Not suitable	Fair to poor; fair compaction, stability, shear strength, and bearing capacity.	High susceptibility to frost heaving.	Slight seepage; sites generally favorable.
Harco (484)	Good in surface layer.	Not suitable	Poor to fair; compaction, stability, shear strength, and bearing capacity are poor to fair.	Moderate to high susceptibility to frost heaving; substratum is unstable when wet.	Underlain by silty material, which grades downward to sandy material; moderate seepage.
Harpster (67)	Fair to a depth of 18 inches; clayey; calcareous; low in available phosphorus and potassium.	Not suitable	Poor; high water table; difficult to compact; poor bearing capacity when wet; moderate to high shrink-swell potential; poor to fair shear strength.	High susceptibility to frost heaving; high water table; subject to flooding.	High water table; subject to overflow or ponding.

interpretations—Continued

Soil features affecting suitability for—Continued					Limitation for use as disposal field for septic tanks
Farm Ponds—Con.: Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Good to fair resistance to piping.	Slow permeability; drainage needed in some places; open ditches best suited.	Slow permeability; high water-holding capacity; moderate to slow intake rate; some areas are sloping; other characteristics favorable.	No major construction problems if topography is favorable.	No major construction problems; fertility of exposed subsoil is low.	Severe; seasonal high water table; slow permeability.
Poor stability; high shrink-swell capacity; difficult to excavate or compact; suitable for use as core material in zoned fill.	Very slow permeability; subject to overflow unless protected; drainage needed; open ditches best suited.	Very slow permeability; high water-holding capacity; slow intake rate; needs drainage and protection from flooding.	Not needed	Not needed	Severe; very slow permeability; high water table; subject to flooding.
Poor stability, compaction, and resistance to piping.	Not needed; natural drainage adequate.	High water-holding capacity; moderate intake rate.	No major construction problems if topography is favorable.	No major construction problems.	Slight on 0 to 4 percent slopes; moderate on 4 to 7 percent slopes; moderate permeability.
Poor to fair stability; difficult to compact; fair to good resistance to piping; suitable for use as core material in zoned fill.	Moderately slow permeability; subject to flooding unless protected; drainage needed; tile works well under good management.	High water-holding capacity; moderate intake rate.	Not needed	Seldom used; no major construction problems.	Severe; seasonal high water table; subject to flooding; moderately slow permeability.
Poor to fair stability; moderate shrink-swell capacity.	Not needed; natural drainage adequate.	High water-holding capacity; moderate to slow intake rate.	No major construction problems if topography is favorable.	Seldom used; no major construction problems.	Severe; subject to flooding; slow to moderately slow permeability; some areas strongly sloping.
Fair to poor; seldom used because of topography.	Not needed; natural drainage adequate.	High water-holding capacity; moderate intake rate; moderate to moderately slow permeability.	Not needed, because of topography.	Seldom needed; no major construction problems.	Moderate; moderate to moderately slow permeability.
Seldom used because of topography; clayey material; tends to slump when wet.	Moderately slow permeability; subject to flooding unless protected; tile and open ditches needed for drainage.	High water-holding capacity; low to moderate intake rate; moderately slow permeability.	Not needed, because of topography.	Not needed, because of topography.	Severe; high water table; subject to flooding; moderately slow permeability.

TABLE 8.—*Engineering*

Soil series and map symbol	Suitability as a source of—			Soil features affecting suitability for—	
	Topsoil	Sand or gravel	Highway subgrade material	Highway location	Farm ponds: Reservoir area
Haymond (331)	Good; on flood plains; well drained.	Not suitable.	Poor to fair; on flood plains; well drained; poor stability, compaction, shear strength, and bearing capacity; low shrink-swell potential.	Moderate to high susceptibility to frost heaving.	Seepage generally is excessive; subject to occasional flooding.
Hickory (8C2, 8D3, 8E3, 8F2).	Good in surface layer; generally contains some small stones; some areas are steep and eroded.	Generally not suitable.	Poor to fair; compaction, stability, shear strength, and bearing capacity are poor to fair; shrink-swell potential is low to moderate.	Slopes erodible; moderate susceptibility to frost heaving; subject to seepage; plastic when wet; hilly; cuts and fills needed.	Slight seepage; sites generally favorable.
Hosmer (214B, 214C, 214C2, 214C3, 214D, 214D2, 214D3, 214E2, 214E3).	Good to fair in surface layer; some areas are sloping and have a thin surface layer.	Not suitable.	Poor to fair; compaction, stability, shear strength, and bearing capacity are poor to fair; firm fragipan at a depth of 3 feet.	Slopes erodible; seepage occurs in cuts at top of fragipan; high susceptibility to frost heaving; cuts and fills frequently needed.	Slight seepage; slowly permeable fragipan; sites generally favorable.
Iva (454B)	Good in surface layer.	Not suitable.	Poor to fair; compaction, stability, shear strength, and bearing capacity are poor to fair.	Deep loess; unstable when wet; high susceptibility to frost heaving; seepage in cuts.	Moderate seepage; underlain by permeable loess.
Jules (28)	Good.	Not suitable.	Poor; silty material; poor compaction, stability, shear strength, and bearing capacity.	High susceptibility to frost heaving; unstable when wet.	Moderate seepage; underlain by permeable, silty material.
Karnak (426, W426)	Poor; clayey and dense; generally wet in spring; areas of mapping unit W426 ponded in many places.	Not suitable.	Poor; on flood plains, clayey; high water table; high compressibility and shrink-swell potential; poor workability; fair to poor compaction and stability; poor shear strength; hard to excavate	Subject to overflow; high shrink-swell potential; highly plastic; hard to excavate and compact; high water table.	On bottom lands; subject to overflow; generally not used for farm ponds.
Lamont (175B, 175C, 175D2).	Poor; sandy; low content of organic matter and low water-holding capacity.	Good to fair source of sand below a depth of 3 feet; generally poorly graded layers of finer textured material are below a depth of 20 inches.	Fair to good below a depth of 8 to 12 inches.	Sandy material; highly erodible; slumps when wet.	Excessive seepage because of underlying sand.

interpretations—Continued

Soil features affecting suitability for—Continued					Limitation for use as disposal field for septic tanks
Farm Ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Poor stability; low resistance to piping.	Not needed; natural drainage adequate; subject to occasional overflow unless protected.	High water-holding capacity; moderate intake rate.	Not needed, because of topography.	Seldom used; no major construction problems.	Moderate; subject to occasional overflow.
Fair to good compaction.	Not needed; natural drainage adequate.	Not suitable; generally too sloping.	Terraces generally not suited because of irregular slopes; no major construction problems.	Channels generally have steep slopes and are difficult to vegetate.	Moderate on 4 to 12 percent slopes, severe on 12 to 30 percent slopes; moderate permeability.
Poor stability; low resistance to piping.	Not needed; natural drainage adequate for the common crops.	Limited rooting depth; slow intake rate; moderate water-holding capacity.	Erodible; difficult to obtain good crop growth in deep cuts; layout of terraces difficult because of irregular slopes.	Vegetation difficult to establish on steep slopes and in deep channels; in some deep gullies sandstone bedrock is exposed.	Severe; slow permeability in fragipan; seepage of effluent on slopes.
Poor stability; low resistance to piping.	Drainage needed in some places; tile can be used.	High water-holding capacity; moderate to slow intake rate.	No major construction problems.	No major construction problems.	Moderate to severe; moderate to moderately slow permeability; seasonal high water table.
Seldom used because of topography; poor stability, low resistance to piping.	Not needed; natural drainage adequate.	High water-holding capacity; moderate intake rate.	Not needed, because of topography.	Seldom used; no major construction problems.	Slight; no major limiting factors.
Poor stability; high shrink-swell potential; difficult to excavate and compact; suitable for impervious core or blanket material.	Very slow permeability; subject to overflow unless protected; drainage needed; open ditches best suited.	High water-holding capacity; slow intake rate; subject to overflow; needs drainage.	Not needed	Not needed	Severe; subject to overflow; very slow permeability; high water table.
Rapid permeability; subject to piping; seepage through embankments likely.	Not needed; natural drainage adequate.	Low to moderate water-holding capacity; moderately rapid intake rate.	Not suitable; deep sand.	Sandy; difficult to vegetate; low to moderate water-holding capacity.	Slight on slopes of 1 to 4 percent; moderate on slopes of 4 to 12 percent; nearby water supply is subject to pollution because of rapid permeability of substratum.

TABLE 8.—*Engineering*

Soil series and map symbol	Suitability as a source of—			Soil features affecting suitability for—	
	Topsoil	Sand or gravel	Highway subgrade material	Highway location	Farm ponds: Reservoir area
Marissa (176)	Good in surface layer.	Not suitable	Poor to fair; compaction, stability, shear strength, and bearing capacity are poor to fair.	High susceptibility to frost heaving; seasonal high water table.	Underlain by silty material.
Markland (467B, 467B2, 467C2, 467C3, 467D2, 467E).	Fair in surface layer in uneroded areas because of low content of organic matter; poor in eroded areas.	Not suitable	Poor; difficult to work and compact when wet; poor shear strength, workability, and bearing capacity; high shrink-swell potential and compressibility.	High susceptibility to frost heaving; slopes highly erodible; plastic subsoil and substratum.	Slow seepage; generally favorable material.
McGary (173A, 173B, 173B2, 173C2).	Fair in surface layer; low content of organic matter.	Not suitable	Poor; seasonal high water table; difficult to work and compact when wet; poor shear strength, workability, and bearing capacity; high compressibility, and shrink-swell potential.	High susceptibility to frost heaving; slopes highly erodible; seasonal high water table; plastic subsoil.	Slow seepage; soil material generally favorable.
Montgomery (465, 465+)	Poor; clayey; generally wet in spring.	Not suitable	Poor; clayey and plastic; high water table; high compressibility and shrink-swell potential; poor shear strength, workability, and bearing capacity.	High susceptibility to frost heaving; high water table; plastic subsoil.	Slow seepage; high water table.
Okaw (84)	Fair in surface layer; low content of organic matter; generally wet in spring.	Not suitable	Poor; high water table; subsoil and substratum are clayey and highly plastic; difficult to excavate and compact; high compressibility and shrink-swell potential; poor shear strength and bearing capacity.	High susceptibility to frost heaving; seasonal high water table; highly plastic; difficult to excavate and compact; high shrink-swell potential; poor stability.	Slow seepage; seasonal high water table; highly plastic; excavation difficult.
Onarga (190B, 190C)	Good to fair in surface layer; somewhat sandy.	Good as source of sand below a depth of 2 to 3 feet; generally poorly graded; contains fines in places.	Fair in subsoil; fair to good in substratum.	Exposed sand is highly erodible; upper 2 to 3 feet is moderately susceptible to frost action.	Underlain by sand at a depth of 2 to 3 feet; excessive seepage.
Patton (142)	Fair in surface layer; somewhat clayey.	Not suitable	Poor; high water table; poor bearing capacity; moderate shrink-swell potential.	Highly susceptible to frost heaving; high water table.	Underlain by silt loam; high water table.

interpretations—Continued

Soil features affecting suitability for—Continued: Farm Ponds—Con.: Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	Limitation for use as disposal field for septic tanks
Substratum has poor stability; moderate shrink-swell potential.	Moderately slow permeability; drainage generally needed; tile works well.	High water-holding capacity; moderate intake rate; moderately slow permeability; needs drainage.	Not needed, because of topography.	No major construction problems.	Severe; seasonal high water table; moderately slow permeability.
Fair stability and compaction; high shrink-swell potential.	Not needed; natural drainage adequate.	High water-holding capacity; slow intake rate; slow to very slow permeability.	No major construction problems if topography is favorable.	No major construction problems; vegetation difficult to establish; clayey materials; low fertility.	Severe; slow to very slow permeability; most areas are sloping.
Fair stability and compaction; high shrink-swell potential.	Slow to very slow permeability; drainage needed in some places; open ditches best suited.	Moderate to high water-holding capacity; moderate to slow intake rate; slow to very slow permeability; needs drainage.	Heavy clay exposed in deep cuts; terraces difficult to establish because of the shape of the areas.	No major construction problems; material is clayey and low in fertility; vegetation is difficult to establish.	Severe; high water table; very slow permeability.
Poor stability; high shrink-swell potential; difficult to work and compact.	Slow permeability; drainage needed; under good management tile and open ditches work well.	High water-holding capacity; slow intake rate; slow permeability; needs drainage.	Not needed, because of topography.	Not needed, because of topography.	Severe; high water table; slow permeability.
Poor stability; high shrink-swell potential; difficult to compact; suitable for impervious core or blanket material.	Very slow permeability; drainage needed; open ditches best suited.	High water-holding capacity; very slow intake rate; needs drainage.	Not needed	Not needed	Severe; high water table; very slow permeability.
Fair stability in subsoil; rapid permeability in substratum.	Not needed; natural drainage adequate.	Moderate water-holding capacity; moderate intake rate; sand below a depth of 2 to 3 feet.	The sandy substratum is highly erodible if exposed and it is difficult to obtain good crop growth.	The sandy substratum is highly erodible if exposed and is difficult to vegetate.	Slight on slopes of 1 to 4 percent; moderate on slopes of 4 to 10 percent; nearby water supplies are subject to pollution because of rapid permeability of underlying sand.
Poor stability and resistance to piping.	Moderate permeability; drainage needed; tile works well.	High water-holding capacity; moderate intake rate.	Not needed	Seldom used; in places interferes with construction in wet seasons.	Severe; high water table.

TABLE 8.—*Engineering*

Soil series and map symbol	Suitability as a source of—			Soil features affecting suitability for—	
	Topsoil	Sand or gravel	Highway subgrade material	Highway location	Farm ponds
					Reservoir area
Petrolia (288)	Poor; on flood plains; clayey.	Not suitable	Poor; on flood plains; high water table; fair to poor compaction, stability, shear strength, and bearing capacity.	Highly susceptible to frost heaving; seasonal high water table; subject to flooding; plastic material.	On bottom lands; high water table.
Piopolis (420)	Poor; on flood plains; clayey; generally wet in spring.	Not suitable	Poor; on flood plains; high water table; fair to poor compaction, stability, shear strength, and bearing capacity.	Highly susceptible to frost heaving; seasonal high water table; subject to flooding; plastic.	On bottom lands; high water table.
Plano (199A, 199B)	Good in surface layer.	Fair source of sand below a depth of 5 feet; poorly graded.	Fair to poor in subsoil, because compaction, stability, shear strength, and bearing capacity are fair to poor; fair to good in substratum.	Moderate susceptibility to frost heaving; fair to good stability.	Moderate seepage through substratum.
Racoon (109)	Fair; low in content of organic matter.	Not suitable	Poor; high water table; generally wet in spring; poor to fair compaction, stability, shear strength, and bearing capacity.	High susceptibility to frost heaving; poor stability; plastic subsoil.	Seasonal high water table; very slow seepage.
Reesville (723A, 723B, 723B2, 723C2, 723C3).	Good in surface layer unless eroded.	Not suitable	Poor; poor to fair compaction, stability, shear strength, and bearing capacity.	High susceptibility to frost heaving; poor stability when wet; seepage common in cuts.	Moderate seepage through substratum of silt loam.
Roby (184A, 184B)	Fair; moderate water-holding capacity.	Layer of sand that generally is poorly graded below a depth of 4 feet; contains fines in some places.	Fair to poor in subsoil, because compaction, stability, shear strength, and bearing capacity are fair to poor; fair to good in substratum.	Moderate to high susceptibility to frost heaving; fair to poor stability; seasonal high water table.	Excessive seepage through underlying sand; seasonal high water table.
Ruark (178)	Poor; areas generally are wet in spring; moderate water-holding capacity.	Generally poorly graded sand below a depth of 4 feet; in some places substratum contains fines.	Fair to poor in subsoil because of seasonal high water table and fair to poor compaction, stability, shear strength, and bearing capacity; fair to good in substratum.	High susceptibility to frost heaving in subsoil; seasonal high water table.	Excessive seepage through the substratum in places; seasonal high water table.

interpretations—Continued

Soil features affecting suitability for—Continued						Limitation for use as disposal field for septic tanks
Farm Ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways		
Fair stability; fair to poor compaction; moderate shrink-swell potential.	Moderately slow permeability; subject to overflow unless protected; drainage needed; tile works well under good management.	High water-holding capacity; slow intake rate; moderately slow permeability; needs drainage and protection from flooding.	Not needed	Seldom used; no major problems in construction.		Severe; high water table; subject to flooding; moderately slow permeability.
Fair stability; fair to poor compaction; moderate shrink-swell potential.	Slow permeability; subject to overflow unless protected; open ditches needed for drainage.	High water-holding capacity; slow intake rate; slow permeability; needs drainage and protection from flooding.	Not needed	Seldom used; no major problems in construction.		Severe; high water table; subject to flooding; slow permeability.
Fair to good stability; moderate shrink-swell potential when subsoil is used.	Not needed; natural drainage adequate.	High water-holding capacity; moderate intake rate; moderate permeability.	Seldom used; no major construction problems.	No major construction problems.		Slight.
Fair stability; seldom used because of topography.	Slow permeability; open ditches can be used.	High water-holding capacity; moderate to slow intake rate; slow permeability; drainage needed.	Not needed	Seldom used; no major construction problems; low fertility.		Severe; high water table; slow permeability.
Low resistance to piping; fair to poor stability.	Moderately slow to moderate permeability; drainage needed in places; tile works well.	High water-holding capacity; moderate intake rate; moderately slow to moderate permeability.	No major construction problems; difficult to establish because of the shape of the areas.	No major construction problems.		Moderate to severe; moderately slow to moderate permeability; seasonal high water table.
Fair to good stability and compaction and good resistance to piping in subsoil; variable stability and compaction and poor resistance to piping in substratum.	Seasonal high water table; drainage needed in some places; tile or open ditches can be used, but sand occurs below a depth of 4 feet.	Moderate water-holding capacity and intake rate; sand below a depth of 4 feet; seasonal high water table.	Seldom needed; no major construction problems.	Seldom needed; no major construction problems.		Moderate; seasonal high water table; permeability of layers in subsoil moderately slow; because of the seasonal high water table and underlying sand, the ground water is likely to be contaminated in some places.
Fair to good stability and good resistance to piping in subsoil; variable stability and poor resistance to piping below a depth of 4 feet.	Slow permeability; drainage needed; seasonal high water table; open ditches can be used.	Moderate water-holding capacity and intake rate; sandy material below a depth of 4 feet; seasonal high water table.	Not needed	Seldom needed; clayey subsoil; low fertility.		Severe; slow permeability; seasonal high water table; because of the seasonal high water table and underlying sand, the ground water is likely to be contaminated in some places.

TABLE 8.—*Engineering*

Soil series and map symbol	Suitability as a source of—			Soil features affecting suitability for—	
	Topsoil	Sand or gravel	Highway subgrade material	Highway location	Farm ponds: Reservoir area
Sarpy (92)	Poor; sandy; low water-holding capacity; calcareous.	Good as source of fine sand; generally poorly graded.	Fair to good; on flood plains; sandy; calcareous; many areas are small and wooded.	Moderate susceptibility to frost heaving; subject to flooding.	Subject to flooding; sandy; excessive seepage.
Sawmill (107)	Fair to a depth of 2 or 3 feet; somewhat clayey, but high content of organic matter.	Not suitable	Poor; on flood plains; high water table; poor compaction, stability, shear strength, and bearing capacity.	High susceptibility to frost heaving; seasonal high water table; subject to flooding; plastic.	On bottom lands; slight to moderate seepage.
Sciotoville (462A, 462B, 462C2, 462D2, 462E2).	Fair to good in surface layer; low content of organic matter.	Not suitable	Poor to fair; compaction, stability, shear strength, and bearing capacity are poor to fair.	Moderate to high susceptibility to frost heaving; poor stability; seepage occurs above fragipan in cuts.	Slight seepage
Sexton (208)	Fair in surface layer; areas generally wet in spring.	Not suitable	Poor; high water table; generally wet in spring; compaction, stability, shear strength, and bearing capacity are poor in subsoil and fair to poor in substratum.	High susceptibility to frost heaving; poor stability; seepage common in cuts.	Seasonal high water table; slight seepage.
Shiloh (138)	Poor; clayey; areas generally wet in spring.	Not suitable	Poor; high water table; floods occasionally; subsoil is clayey and highly plastic; poor workability, compaction, stability, and shear strength; high shrink-swell potential.	High susceptibility to frost heaving; plastic material; seasonal high water table; subject to occasional flooding; slopes unstable.	Seasonal high water table.
Starks (132A, 132B)	Good to fair in surface layer.	Fair to good as a source of sand below a depth of 3½ feet; generally poorly graded; contains fines in some places.	Poor in surface layer and subsoil; seasonal high water table; poor to fair compaction, stability, shear strength, and bearing capacity; fair to good in substratum.	High susceptibility to frost heaving; sandy material is at depth of about 3½ feet; seasonal high water table.	Sandy substratum; rapid seepage likely.
Stoy (164A, 164B)	Fair in surface layer.	Not suitable	Poor to fair; seasonal high water table; poor to fair compaction, stability, shear strength, and bearing capacity.	High susceptibility to frost heaving; subsoil is plastic; seasonal high water table; splopes erodible and seepy in many places.	Generally good

interpretations

Soil features affecting suitability for—Continued					Limitation for use as disposal field for septic tanks
Farm Ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Low resistance to piping; high seepage rate.	Not needed; natural drainage excessive.	Very low water-holding capacity; rapid intake rate.	Not needed	Not needed	Severe; subject to flooding; nearby water sources may be polluted because of very rapid permeability.
Seldom used because of topography; high content of organic matter.	Moderate permeability; subject to flooding; drainage needed; tile works well.	High water-holding capacity; moderate intake rate; subject to flooding.	Not needed	Not needed	Severe; seasonal high water table; subject to flooding.
Fair stability and compaction; fair resistance to piping.	Not needed; natural drainage adequate for common crops.	High water-holding capacity; slow intake rate; limited root depth.	No major construction problems; difficult to apply because of shape of the areas; highly erodible.	No major construction problems; vegetation difficult to establish if cuts are made into fragipan when shaping is done.	Severe; permeability moderately slow in fragipan; some areas are sloping.
Seldom used because of topography.	Slow permeability; seasonal high water table; open ditches can be used; tile drains do not work well.	High water-holding capacity; slow intake rate; slow permeability.	Not needed	Seldom needed; no major construction problems; low fertility.	Severe limitations; slowly permeable; seasonal high water table.
Seldom used because of topography; fair to poor stability; high shrink-swell potential; high compressibility.	Slow to moderately slow permeability; open ditches needed for drainage; tile drains work slowly.	High water-holding capacity; slow intake rate; slow to moderately slow permeability.	Not needed	Not needed	Severe; slow to moderately slow permeability; seasonal high water table; subject to occasional flooding.
Sandy substratum is rapidly permeable; rapid seepage likely.	Needs drainage in some places; tile works well; sand pockets a hazard.	Moderate to high water-holding capacity; moderate to slow intake rate.	No major construction problems; difficult to install because of shape of the areas.	No major construction problems.	Moderate; seasonal high water table; moderate to moderately slow permeability; because of sandy substratum, domestic water supplies may be subject to pollution.
Poor to fair stability and poor resistance to piping.	Slow permeability; open ditches needed for drainage in some areas.	High water-holding capacity; slow intake rate; slow permeability.	No major construction problems if topography is favorable.	No major construction problems; low fertility.	Severe; slow permeability; seasonal high water table.

TABLE 8.—*Engineering*

Soil series and map symbol	Suitability as a source of—			Soil features affecting suitability for—	
	Topsoil	Sand or gravel	Highway subgrade material	Highway location	Farm ponds: Reservoir area
Tice (284)	Fair to a depth of about 2 feet; somewhat clayey; water table is likely to be high.	Not suitable	Poor; on flood plains; seasonal high water table; poor to fair compaction, stability, shear strength, and bearing capacity.	High susceptibility to frost heaving; plastic material; seasonal high water table; subject to flooding.	On bottom lands; seasonal high water table.
Uniontown (482A, 482B, 482C2, 482C3, 482D2, 482E3).	Fair to good in surface layer; eroded areas are somewhat clayey and low in content of organic matter.	Not suitable	Poor to fair; compaction, stability, shear strength, and bearing capacity are poor to fair.	Moderate to high susceptibility to frost heaving; substratum unstable when wet; sloping areas are erodible.	Substratum is silty, and seepage is moderate.
Wabash (83)	Poor; on flood plains; high water table; areas generally wet in spring.	Not suitable	Poor; on flood plains; high water table; generally wet in spring; clayey and plastic; high compressibility and shrink-swell potential; poor workability; fair to poor compaction and stability; poor shear strength.	High susceptibility to frost heaving; plastic material; slopes unstable; high water table; subject to flooding.	On bottom lands; seasonal high water table.
Wakeland (333)	Good; on flood plains.	Not suitable	Poor to fair; seasonal high water table; compaction, stability, shear strength, and bearing capacity are poor to fair.	High susceptibility to frost heaving; seasonal high water table; subject to flooding.	Seasonal high water table; subject to flooding.
Wallkill (W464)	Poor; water at or on the surface most of year.	Not suitable	Not suitable; generally wet or ponded; unstable peat or muck; subject to flooding.	Water at or on the surface most of year; underlain by peat or muck; subject to flooding.	Water at or on the surface most of year; peat or muck subsoil.
Weinbach (461A, 461B)	Fair in upper 2 feet.	Not suitable	Poor to fair; seasonal high water table; poor to fair compaction, stability, shear strength, and bearing capacity.	High susceptibility to frost heaving; poor stability.	Moderate seepage
Weir (Mapped only in an undifferentiated group with Wynoose soils.)	Fair in surface layer; low content of organic matter; areas generally wet in spring.	Not suitable	Poor; high water table; generally wet in spring; poor to fair compaction, stability, shear strength, and bearing capacity.	High susceptibility to frost heaving; subsoil is plastic; seasonal high water table.	Seasonal high water table; slow seepage.

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Soil features affecting suitability for—Continued					Limitation for use as disposal field for septic tanks
Farm Ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Fair stability and compaction.	Moderate to moderately slow permeability; subject to overflow if not protected; drainage needed; tile works well.	High water-holding capacity; moderate to slow intake rate; drainage and protection from flooding needed.	Not needed	Seldom needed; no major construction problems.	Severe; seasonal high water table; subject to flooding; moderate to moderately slow permeability.
Fair to good stability and compaction in subsoil; poor stability and compaction and low resistance to piping in substratum.	Not needed; natural drainage adequate.	High water-holding capacity; moderate intake rate.	No major construction problems; difficult to apply because of shape of the areas.	No major construction problems.	Moderate because of permeability and slopes on all except mapping unit 482E3, which has severe limitations.
Fair stability; fair to poor compaction; high shrink-swell potential; high compressibility; suitable for impervious cores and blankets.	Very slow permeability; open ditches needed for drainage.	High water-holding capacity; slow intake rate; very slow permeability; needs drainage.	Not needed	Not needed	Severe; high water table; subject to flooding; very slow permeability.
Poor stability; fair to poor compaction; poor resistance to piping.	Moderate permeability; drainage generally needed; tile works well.	High water-holding capacity; moderate intake rate; moderate permeability; generally needs drainage and flood protection.	Not needed	Seldom needed; no major construction problems.	Severe; seasonal high water table; subject to flooding.
Not suitable; unstable organic peat or muck in subsoil.	Drainage needed but generally not feasible.	Not suitable; wet most of year; difficult to drain.	Not needed	Not needed	Severe; water at or on the surface most of year; subject to flooding; underlain by unstable peat or muck.
Fair to poor stability and compaction.	Slow permeability; drainage needed in most of the nearly level areas; open ditches suited.	High water-holding capacity; moderate intake rate; slowly permeable.	No major construction problems.	No major construction problems.	Severe; slow permeability; seasonal high water table.
Poor stability; fair to poor compaction; poor resistance to piping.	Slow permeability; drainage needed; open ditches can be used.	Somewhat restricted rooting zone; slow intake rate; slowly permeable.	Not needed	No major construction problems; grass difficult to establish; low fertility.	Severe; slow permeability; seasonal high water table.

TABLE 8.—*Engineering*

Soil series and map symbol	Suitability as a source of—			Soil features affecting suitability for—	
	Topsoil	Sand or gravel	Highway subgrade	Highway location	Farm ponds: Reservoir area
Wellston (339D2, 339E2, 339E3, 339F2, 986F2).	Fair in surface layer; contains stones or gravel in places.	Not suitable	Poor to fair in upper layers; shallow to bedrock.	Moderate susceptibility to frost heaving; shallow to bedrock; stones in upper layers; slopes erodible.	Fractured rock near surface; rapid seepage.
Worthen (37)	Good; high content of organic matter.	Not suitable	Fair to poor; high content of organic matter; fair to poor compaction, stability, shear strength, and bearing capacity.	High susceptibility to frost heaving; poor stability.	High content of organic matter; substratum silty and moderately permeable; moderate seepage.
Wynoose (12)	Fair in surface layer; low content of organic matter; areas generally wet in spring.	Not suitable	Poor; high water table; generally wet in spring; poor to fair compaction, stability, shear strength, and bearing capacity.	High susceptibility to frost heaving; plastic subsoil; seasonal high water table.	Seasonal high water table; very slow seepage.
Zanesville (340D2, 340E2, 340E3, 340F2).	Good in surface layer; low content of organic matter.	Not suitable	Poor to fair; poor stability; poor to fair compaction, shear strength, and bearing capacity.	High susceptibility to frost heaving; seepy above fragipan and at bedrock; bedrock generally within a depth of 3½ feet; slopes erodible.	Not suitable, because of slopes.

In some ways this system of naming textural classes is comparable to the systems most commonly used by engineers for classifying soils; that is, the system of the American Association of State Highway Officials AASHO), and the Unified System.

Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials (*1*). In this system soil materials are classified in seven principal groups. The groups range from A–1 (gravelly soils having high bearing capacity, the best soils for subgrade), to A–7 (clayey soils having low strength when wet, the poorest soils for subgrade). Within each group the relative engineering value of the soil material is indicated by a group index number. Group index numbers range from 0 for the best material to 20 for the poorest. The group index number is shown in parentheses following the soil group symbol in table 6.

Some engineers prefer to use the unified soil classification system (*24*). In this system soil materials are identified as coarse grained, eight classes; fine grained, six classes; and highly organic. The last column in table 6 gives the classification of the tested soils according to the Unified system.

Engineering test data

Soil samples from seven soil profiles representing seven extensive series in Gallatin County were sampled at representative locations by the Soil Conservation Service and by the Illinois Agricultural Experiment Station. These samples were tested in accordance with the standard procedures of AASHO to help evaluate the soils for engineering purposes. The results of these tests and the classification of each soil sample according to both the AASHO and the Unified systems are given in table 6.

The samples tested do not represent the entire range of soil characteristics in Gallatin County, or even within the soil series sampled. The results of the tests, however, can be used as a general guide in estimating the physical properties of the soils in the county. Tests made were for moisture density relationships, grain-size distribution, liquid limit, and plasticity index.

In the *moisture density*, or compaction test, a sample of the soil material is compacted several times with a constant compactive effort, each time at a successively higher moisture content. The moisture content increases until the optimum moisture content is reached. After that the density decreases with increase in moisture content. The highest density obtained in the compaction test is

interpretations

Soil features affecting suitability for—Continued					Limitation for use as disposal field for septic tanks
Farm Ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Not suitable; less than 3 feet to bedrock.	Not needed; natural drainage adequate.	Not suitable; steep slopes; shallow to bedrock.	Not suitable; steep slopes; shallow to bedrock.	Difficult to establish sod because soils have steep slopes and are shallow to rock.	Severe; shallow to bedrock; pollution of local water supply likely; strongly sloping to steep.
Poor stability and compaction; low resistance to piping.	Not needed; natural drainage adequate.	High water-holding capacity; moderate intake rate; moderate permeability.	Not needed	Seldom needed; no major construction problems.	Slight.
Fair stability; good to poor resistance to piping.	Very slow permeability; open ditches needed for drainage.	Somewhat restricted root zone; slow intake rate; very slow permeability.	Not needed	Seldom needed; vegetation difficult to establish; clayey subsoil; low fertility.	Severe; very slow permeability; seasonal high water table.
Not suitable, because soils are shallow to fractured rock.	Not needed; natural drainage adequate.	Not suitable, because of slopes.	Not suitable, because of excessively steep slopes.	Very erodible; bedrock exposed in deep cuts; low water-holding capacity and fertility.	Severe; very slow permeability in fragipan; slopes more than 10 percent in most places; bedrock at a depth of 40 inches or less.

termed "maximum dry density." Moisture-density data are important in construction, for as a rule, optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

The results of the mechanical analysis, obtained by combined sieve and hydrometer methods, may be used to determine the relative proportions of the different size particles that make up the soil sample. The percentage of fine-grained material, obtained by the hydrometer method, which generally is used by engineers, should not be used in determining textural classes of soils.

The tests to determine liquid limit and plastic limit measure the effect of water on consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As 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 passes from a semisolid to a plastic state. The *liquid limit* is the moisture content at which the soil material passes from a plastic to a liquid state. The *plasticity index* is the numerical difference between liquid limit and plastic limit. It indicates the range in moisture content within which a soil material is in a plastic condition.

Engineering properties

In table 7 the soil series and the symbol for each mapping unit are listed and estimates of properties significant in engineering are given. The estimated physical properties are those of the typical soil. Where test data are available, that information was used. Where tests were not performed, the estimates shown are based on comparisons with the soils that were tested in Gallatin County and with similar soils tested in other counties.

Depth to bedrock, in table 7, is the minimum depth at which bedrock is likely to occur in most places in the county. Depth to the seasonal high water table is the maximum height to which the water table rises during the year, which generally is early in spring. The estimates are for soil material that has not been artificially drained.

Permeability of the soil as it occurs in place was estimated. The estimates are based on the structure, porosity, and consistence of the soil material and on field observations. The estimates were compared with permeability tests on undisturbed cores of similar soil material.

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The available water capacity, given in inches per inch of soil, refers to the approximate amount of capillary water in a soil that is wet to field capacity. When the soil is air dry, this amount of water will wet the soil material to a depth of 1 inch without deeper percolation. The estimates are based on data from undisturbed soil samples or from field measurements of selected soils.

Reaction gives the intensity of the acidity or alkalinity of the soil, expressed in pH values. A pH notation of 7.0 is neutral. A lower value indicates acidity, a higher value indicates alkalinity.

The ratings for shrink-swell potential indicate the volume change resulting from the shrinking of the soil when it dries and the swelling of the soil at it takes up moisture. It is estimated on the basis of the amount and type of clay in the soil layers. In general, soils classified as A–7 and CH have high shrink-swell potential. Clean sands and gravel and those having a small amount of nonplastic to slightly plastic fines have low shrink-swell potential, as does most other nonplastic to slightly plastic soil material.

The estimates of corrosion rates in table 7 are for the soil horizon in which conduits would likely to be buried. The estimates are based on soil texture, on the amount and type of clay in the soil, the total acidity, the amount and kind of soluble salts present, the moisture content of the soil, and the kind of conduit material (untreated steel pipes).

Engineering interpretations

Table 8 gives ratings of the suitability of the soils of Gallatin County as a source of topsoil, sand or gravel, and for highway subgrade material; gives features that affect work on highways and on structures that conserve soil and water; and gives limitations of the soils for use as disposal fields for septic tanks. The interpretations are based on test data and on field experience. Except for use as topsoil, highway subgrade material, and farm pond embankments, all ratings are for undisturbed soil material.

The suitability of the soils as a source of topsoil refers to soil material, preferably rich in organic matter that is used as a topdressing for roadbanks, lawns, gardens, and other areas where a good seedbed is needed for establishment of vegetation. Only the surface layer of a soil was rated, unless the subsoil also was considered to have properties making it suitable for use as topsoil. Properties considered in rating the material as a source of topsoil were ease of excavation, available moisture capacity, content of organic matter and of gravel and stones, and texture and stability of the material.

Ratings of the suitability of the soils as a source of sand or gravel are based on the expected stratification and gradation of the material, the amount of fines in the material, and on other features that affect the source. A detailed investigation at the site of a probable source is needed to determine the suitability of sandy or gravelly material for a specific use.

Ratings of the suitability of the soils as a source of subgrade material for payments are based on the estimated AASHO classification of the soil materials that would normally be used in the subgrade. Coarse-textured soil materials are rated good. Of the fine-textured soil materials, silt, which has low plasticity, is rated fair; and clay, which is plastic and loses strength when wet, is rated poor. Silty materials are susceptible to damage by freezing and thawing, however, and would be rated poor in areas where freezing occurs to a depth of more than 6 inches and the water table is within 3 feet of the surface of the subgrade.

The location of a highway is influenced by depth to bedrock or other limiting material and by local drainage. Blasting normally is required to excavate deep cuts in sandstone and generally is needed in areas of Berks, Hosmer, Wellston, and Zanesville soils. The difficulty of excavating in bedrock and the chance of seepage along bedding planes in the bedrock should be investigated at the proposed site of the highway. If undesirable soil material is within or slightly below the subsoil, the stability of the roadbed will be affected. The McGary soils, for example, have a subsoil or substratum of very plastic clay, which impedes internal drainage and generally causes the soils to have low stability when wet. Deep, loessal soils, such as the Alford and Bold soils, are unstable and require special treatment if used on slopes in roadcuts.

In areas that are flooded occasionally or seasonally or where the water table is high, the surface of a pavement should be built at least 3 feet above high water or above the ground water table. Interceptor ditches or underdrains can be used for control of subsurface seepage.

Some features that affect the suitability of the soils for farm ponds are depth to bedrock, permeability, strength and stability, water capacity, and kind of underlying material. Other factors considered are ground water level, shrink-swell potential, stoniness, and slope. Soils underlain by sandstone, permeable loess, or sand are likely to be excessively permeable and have sharply reduced capacity for permanent storage of water. Soils in which depth to bedrock would be less than 2 feet below the bottom of the proposed pond ought not to be used as sites for ponds unless special treatment is used to avoid seepage.

The need for drainage and the kind of drainage needed to correct wetness is indicated in table 8. The soil features considered in evaluating the suitability of the soils for this use are permeability, depth of the soil, and soil texture. Some of the more extensive soils requiring drainage are the Beaucoup, Patton, and Tice soils. In these soils, tile drains work well.

Suitability of the soils for use as grassed waterways is also shown in table 8. The ratings are based on the permeability and the depth of the soils. They are also based on the available water holding capacity of the soils and their wetness.

Limitations of the soils for use as drainage fields for septic tanks and soil features that affect their use for this purpose are also shown in table 8. Some of the limiting factors are slow permeability and a seasonal high water table. Other limiting factors are steep slopes, shallowness to bedrock, and the possibility of pollution because of a rapidly permeable substratum.The ratings are based mainly on the gently sloping soils of each series.

Where slope is the only limiting factor, the degree of limitation for a specific mapping unit is shown in the rating. Soils that have slopes of more than about 4 percent are rated no better than moderate; those that have slopes of more than about 12 percent are rated severe; and very rocky soils are rated severe, regardless of other properties.

A rating of *slight* means that the soil generally is well suited for use as disposal fields for septic tanks. A rating of *moderate* means that the soil generally is suitable, but the suitability is borderline and careful investigation is needed at the site of the proposed installation. The rating *severe* means that the soil is suitable for use as drainage fields for septic tanks only if care is used in planning and installing the system.

Soils that are rated moderate generally require larger drainage fields than those having slight limitations. Some of the soils rated severe are not suitable for use as disposal fields for septic tanks, and all soils that have a severe rating should be carefully investigated at the proposed site. Soils subject to flooding, for example, should not be used for disposal fields.

Residential development

The engineering features discussed in tables 6, 7, and 8 greatly affect the suitability of the soils for use as sites for residential development. Among the main factors to be considered are kind of drainage, depth to bedrock, nature of the subsoil and underlying material, and hazard of flooding.

Many of the soils in Gallatin County have slow internal drainage, are slowly permeable, and are wet. Such soils are poor for building sites. For example, sewage disposal systems do not function properly in soils that have a slowly permeable subsoil or a seasonal high water table. Also, if basements are built in wet soils, special effort is needed to overcome the wetness and keep the basements dry.

Other soils are poor for building sites because they are steep and are shallow to bedrock. Examples are the Berks and Wellston soils, which are mostly steep and less than 3 feet to bedrock. Moduately sloping areas of these soils generally are suitable for buildings constructed on slabs. Excavation for basements and footings is likely to be difficult. In addition, because depth to bedrock is shallow, the areas provide poor sites for septic tank disposal fields.

Some of the soils are poor for building sites because they are subject to flooding. Allison soils, for example, are deep and well drained. They are subject to annual flooding, however, and make poor building sites. Among other soils that are subject to flooding are the Bonnie and Birds soils, which have a seasonal high water table. On the other hand, Alford soils generally provide good building sites. These soils are above the flood plain and are deep and moderately permeable.

Other information helpful in determining the suitability of a particular soil for residential development can be gained from the soil descriptions and from the soil maps at the back of this survey. Such information can be used by planning groups and by others responsible for directing development of the county as a guide in long range planning.

Formation and Classification of Soils

In this section the factors that affected the formation of the soils in Gallatin County are discussed. Then the current system of soil classification is explained and the soil series are placed in higher categories. The soil series in the county, including a profile representative of each series, are described in the section "Descriptions of the Soils."

Factors of Soil Formation

Soil is formed by weathering and other processes that act on parent material. The characteristics of the soil at any given point depend upon parent material, climate, plants and animals, relief, and time.

Climate and plants and animals are the active forces of soil formation. They act on the parent material accumulated through the weathering of rocks and slowly change it into soil. All five factors come into play in the formation of every soil. The relative importance of each differs from place to place; sometimes one is more important and sometimes another. In extreme cases one factor may dominate in the formation of a soil and fix most of its properties. In general, however, it is the combined action of the five factors that determines the present character of each soil.

The relationship of some Gallatin County soils to the landscape, the parent material, and native vegetation is shown in figure 18. How the five major factors of soil development have influenced the soils in the county are discussed in relation to the various soil associations in the paragraphs that follow. The location of the soil associations in the county is shown on the general soil map at the back of this survey, and each association is described in the section "General Soil Map."

Parent material—The parent materials of the soils in Gallatin County are mainly glacial till, loess, or alluvium and lakebed sediments.

The northern part of Gallatin County is in the Mount Vernon Hill Country, which is a subdivision of the Till Plains Section of the Central Lowland province. This province includes the Illinoian Basin, the southern rim of which is near Gallatin County. All of these areas have a cover of glacial drift and loess. The underlying rocks are mostly of Pennsylvanian age. Regional dip of the rocks is to the north, but several faults and folds in the area dip to the north-northeast (*18*). The southern part of the county is in the Shawnee Hills section of the Interior Low Plateaus province (*12*). This part of the country was not glaciated but was covered by loess. The underlying rock is chiefly Pennsylvanian sandstone, siltstone, and shale.

During the Illinoian glacial period, the northwestern part of the county was covered with glacial till and deposits of outwash were left on some of the low uplands west of New Haven. The till and outwash later were covered by deposits of loess. In time the loess was removed by erosion from the steep slopes in the northwestern part of the county. The Hickory soils, in soil association 3, are examples of soils formed in the glacial till. Examples of soils formed partly in loess and partly in material from Pennsylvanian sandstone, siltstone, and shale are the

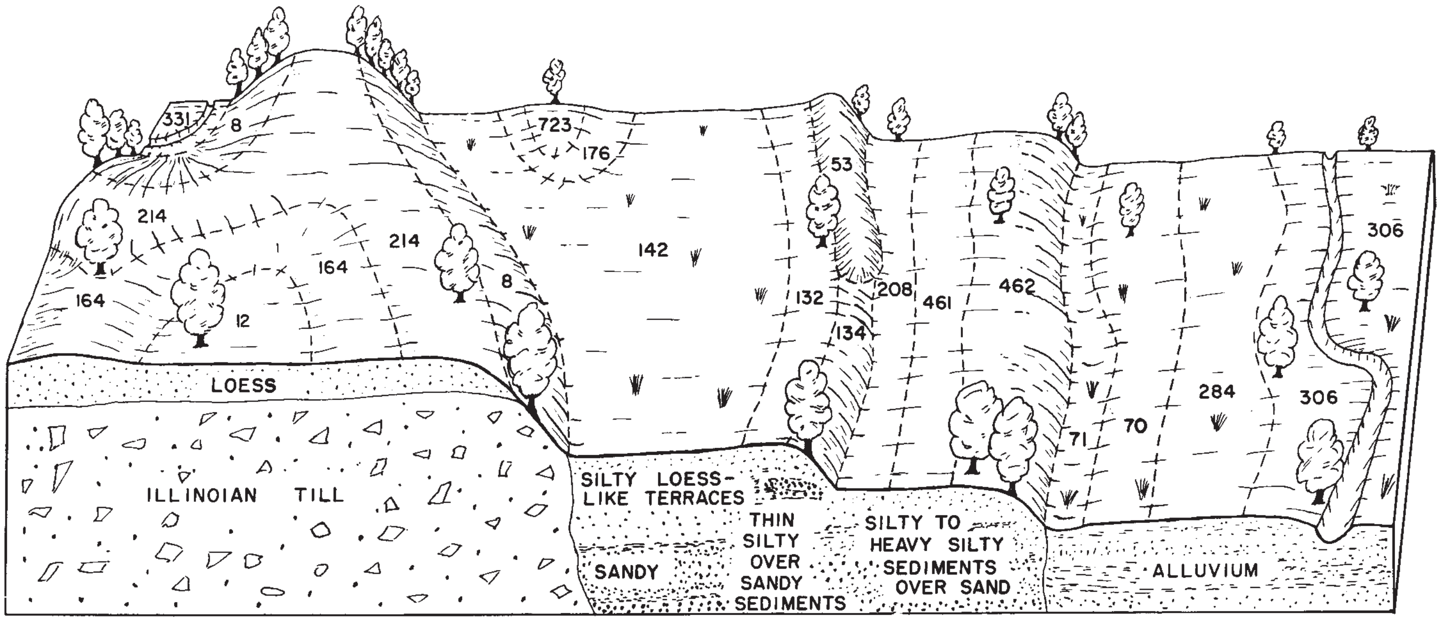

Figure 18.—**The relationship of some Gallatin County soils to the landscape, parent material, and native vegetation. The soil series are identified as follows: *8,* Hickory; *12,* Wynoose and Weir; *53,* Bloomfield; *70,* Beaucoup; *71,* Darwin; *132,* Starks; *134,* Camden; *142,* Patton; *164,* Stoy; *176,* Marissa; *208,* Sexton; *214,* Hosmer; *284,* Tice; *306,* Allison; *331,* Haymond; *461,* Weinbach; *462,* Sciotoville; 723, Reesville.**

Wellston and Berks soils. These soils occupy steep slopes in the southern part of soil association 2.

Most of the soils in the uplands formed from loess, or windblown silt, deposited during the Illinoian glacial period and during the late Wisconsin glaciation. The loess was deposited at three different times. The oldest, and lower loess, the Loveland, was deposited during the Illinoian period. It occurs in a few places in the southern part of soil associations 1 and 2, but it is covered by two younger loessal deposits and is not an important parent material in the county.

Overlying the Loveland loess is the Farmdale or Roxana, and over this is the Peorian loess, the youngest of the three deposits of loess. The Farmdale and Peorian deposits were laid down during the Wisconsin glaciation. Except in areas where these two deposits have been eroded away, they cover the uplands throughout the county. The Farmdale, however, is less important as a parent material than the Peorian loess. In thickness the Peorian loess ranges from more than 25 feet near the Wabash and Ohio Valleys to about 3⅓ feet in the northwestern part of the county (*4*). Peorian loess is the main parent material of the soils in soil associations 1, 2, and 3.

The relationship of soil development to thickness of loess is illustrated by the soils in soil associations 1, 2, and 3. The soils in soil association 1 that formed from thick deposits of loess are very weakly developed to moderately developed. Development of the soils in soil association 2 that formed from moderately thick deposits of loess is moderately strong. On the other hand, the soils in soil association 3 that formed from thin deposits of loess on Illinoian till are strongly developed.

The parent material of most of the soils in Gallatin County is alluvium or lakebed sediments. Many of the soils formed in these materials are on terraces or second bottoms and ordinarily are not subject to further deposition from overflow. The higher terrace level has a cover of loess, and in these areas the soils are strongly influenced by the loess.

On the present flood plains, the soils are subject to flooding and further deposition of material unless they are protected by levees. The parent material of the soils on both the terraces and bottom lands ranges from sand or loamy sand to silty clay or clay and from acid to calcareous. The terraces are in soil associations 4, 5, 6, 7, and 8; the bottom lands are in soil association 9. In general, the parent material deposited by the Ohio River, or influenced mainly by this river, is more acid than the parent material deposited by the Wabash River. The soils of association 8 formed in the more acid material.

Climate.—Climate affects the formation of soils through its influence on the rate of weathering of parent material. The humid, temperate climate of Gallatin County is conducive to the relatively rapid breakdown of soil minerals, to the formation of clay, and to the movement of these materials downward in the soil profile.

Translocation of material is particularly pronounced in the more nearly level, poorly drained soils in the county, and in time a claypan develops in such soils. This claypan restricts or slows down movement of water and air through the soil profile. A fragipan or siltpan has developed in some other soils. Examples are the Ava, Hosmer, and Zanesville soils, which are in the uplands and are moderately well drained. The fragipan that has formed in these soils is very slowly permeable and is very hard when dry. It restricts penetration of roots and thus reduces the volume of soil from which plants are able to obtain water and nutrients. The development of the fragipan in these soils is believed to be related to the stage of weathering, the texture of the parent material, and the depth to a perched water table (*8*). Close packing of the silt particles, which have clay bridging between them, may account for the density of the fragipan.

Plants and animals.—Plants have had the main effect on the formation of soils in this county, but the animals and organisms that live on and in the soils have also been important. The changes they 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 soil are affected, in turn, by the climate, the parent material, relief, and age of the soil.

Most of the soils in the county formed under forest and are light colored. At the time of settlement, however, stands mainly of prairie grasses and swamp grasses, but that included some trees, covered some of the soils in soil association 6, and these soils are dark colored. Some of the soils on the bottom lands also are dark colored because they formed under mixed stands of prairie grasses, swamp grasses, and hardwoods. In general, soils formed under grasses are darker colored and contain more organic matter than those formed under trees.

Small burrowing animals, insects, grubs, earthworms, crawfish, fungi, microbes, and other organisms influence the formation of soil by mixing organic matter into the soil and by helping to break down plant remains. Mixing of soils to varying degrees and depths by crawfish, for example, generally is quite evident in wet areas. Bacteria and fungi aid in the decomposition of plant and animal remains and thus add organic matter to the soils.

Relief.—Relief controls the amount of moisture in the soil through its influences on the amount of runoff, the degree of erosion, and the amount of water infiltrating the soil. In uniform materials, such as loess, differences in natural soil drainage generally are closely associated with slope, or relief.

On steep slopes where runoff is rapid, geologic erosion is likely to almost keep pace with soil development. The steep soils, therefore, are thin, and their horizons are weakly developed.

Time.—The length of time necessary for a given soil to develop depends on the other factors of soil formation. For example, materials low in lime develop into an acid soil much faster than materials high in lime. Permeable soil materials are leached of lime and other soluble minerals much faster than fine-textured, slowly permeable materials.

Soil development generally is faster in a humid climate than in a dry climate, where there is less water available for the breakdown of minerals. In humid climates, however, soils on a stable landscape generally become more strongly developed with increased time of exposure to weathering. On slopes where geologic erosion is rapid, however, soils may be in an early stage of development, even though the slopes have been exposed to weathering for a long time.

Classification of Soils

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 fields and other tracts of land.

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Thus, in classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and used in managing farms, fields, and woodland; 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.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and later revised (*19*). The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965. The current system is under continual study (*17*, *23*). Therefore, readers interested in developments of the current system should search the latest literature available. In table 9 the soil series of Gallatin County are placed in some categories of the current system and in the great soil groups of the older system.

The current system of classification 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 origin are grouped together. The classes of the current system are briefly defined in the following paragraphs.

ORDER.—Ten soil orders are recognized. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate these soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, the Entisols and Histosols, occur in many different kinds of climate. The five orders in Gallatin County are Alfisols, Entisols, Inceptisols, Mollisols, and Ultisols.

Alfisols formed mostly under trees, but some have formed under grass. They are light colored and have a base saturation of more than 35 percent. The base saturation increases with increasing depth.

Entisols are recent mineral soils that do not have genetic horizons or have only the beginnings of such horizons.

Inceptisols generally form on young, but not recent, land surfaces. These soils have weakly developed or incipient horizons.

Mollisols have formed mostly under grass. They have a thick, friable, dark-colored surface layer. Base saturation is more than 50 percent.

Ultisols have a clay-enriched B horizon that has less than 35 percent base saturation, and the base saturation decreases with depth. Those which have formed under grass are likely to have an acid reaction, a dark-colored surface layer less than 10 inches thick, and strongly developed horizons.

SUBORDER.—Each order is subdivided into groups (suborders) that are based mostly on soil characteristics that seem to produce classes having the greatest similarity from the standpoint of their genesis. Suborders narrow the broad climatic range of soils that are in orders.

TABLE 9.—*Soil series classified according to the current system of classification and the 1938 system with its later revisions* [1]

Series	Current classification			Great soil group in 1938 classification
	Family	Subgroup	Order	
Alford	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Allison	Fine-silty, mixed, mesic	Cumulic Hapludolls	Mollisols	Alluvial soils intergrading toward Brunizems.
Alvin	Coarse-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Ava	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Beaucoup	Fine-silty, mixed, noncalcareous, mesic.	Fluventic Haplaquolls	Mollisols	Humic Gley soils.
Belknap	Coarse-silty, mixed, acid, mesic	Aeric Fluventic Haplaquepts.	Inceptisols	Alluvial soils intergrading toward Low-Humic Gley soils.
Berks	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Birds	Fine-silty, mixed, nonacid, mesic	Fluventic Haplaquepts	Inceptisols	Alluvial soils intergrading toward Low-Humic Gley soils.
Bloomfield	Coarse-loamy, mixed, mesic	Psammentic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Regosols.
Bluford	Fine, montmorillonitic, mesic	Albaquic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils.
Bold	Coarse-silty, mixed, calcareous, mesic.	Typic Udorthents	Entisols	Regosols.
Bonnie	Fine-silty, mixed, acid, mesic	Fluventic Haplaquepts	Inceptisols	Alluvial soils intergrading toward Low-Humic Gley soils.
Burnside	Coarse-silty, over sandy or sandy-skeletal, mixed, acid, mesic.	Typic Udifluvents	Entisols	Alluvial soils.
Camden	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Creal	Fine-silty, mixed, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Darwin	Fine, montmorillonitic, noncalcareous, mesic.	Vertic Haplaquolls	Mollisols	Humic Gley soils.
Drury	Fine-silty, mixed, mesic	Dystric Eutrochrepts	Inceptisols	Gray-Brown Podzolic soils intergrading toward Alluvial soils.
Dupo	Coarse-silty over clayey, mixed, nonacid, mesic.	Thapto-Aquollic Udifluvents.	Entisols	Alluvial soils.
Emma	Fine-silty, mixed, mesic	Typic Dystrochrepts	Inceptisols	Gray-Brown Podzolic soils intergrading toward Alluvial soils.
Harco	Fine-silty, mixed, mesic	Aquic Argiudolls	Mollisols	Brunizems.
Harpster	Fine-silty mixed, mesic	Typic Calciaquolls	Mollisols	Humic Gley soils.
Haymond	Coarse-silty, mixed, mesic	Dystric Fluventic Eutrochrepts.	Inceptisols	Alluvial soils.
Hickory	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Hosmer	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Iva	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Jules	Coarse-silty, mixed, calcareous, mesic.	Typic Udifluvents	Entisols	Alluvial soils.
Karnak	Fine, montmorillonitic, nonacid, mesic.	Vertic Haplaquepts	Inceptisols	Alluvial soils intergrading toward Low-Humic Gley soils.
Lamont	Coarse-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Marissa	Fine-silty, mixed, mesic	Argiaquic Argialbolls	Mollisols	Brunizems intergrading toward Planosols.
Markland	Fine, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
McGary	Fine, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Montgomery	Fine, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols	Humic Gley soils.
Okaw	Fine, montmorillonitic, mesic	Typic Albaqualfs	Alfisols	Planosols.
Onarga	Coarse-loamy, mixed, mesic	Typic Argiudolls	Mollisols	Brunizems.
Patton	Fine-silty, mixed, noncalcareous, mesic.	Typic Haplaquolls	Mollisols	Humic Gley soils.
Petrolia	Fine-silty, mixed, nonacid, mesic	Fluventic Haplaquepts	Inceptisols	Alluvial soils intergrading toward Low-Humic Gley soils.
Piopolis	Fine-silty, mixed, acid, mesic	Fluventic Haplaquepts	Inceptisols	Alluvial soils intergrading toward Low-Humic Gley soils.
Plano	Fine-silty, mixed, mesic	Typic Argiudolls	Mollisols	Brunizems.
Racoon	Fine-silty, mixed, mesic	Typic Ochraqualfs	Alfisols	Low-Humic Gley soils.
Reesville	Fine-silty, mixed, mesic	Aeric Ochraqualfs [2]	Alfisols	Gray-Brown Podzolic soils.
Roby	Coarse-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Ruark	Fine-loamy, mixed, mesic	Typic Ochraqualfs	Alfisols	Low-Humic Gley soils.
Sarpy	Sandy, mixed, mesic	Typic Udipsamments	Entisols	Alluvial soils.
Sawmill	Fine-silty, mixed, noncalcareous, mesic.	Cumulic Haplaquolls	Mollisols	Humic Gley soils intergrading toward Alluvial soils.

See footnotes at end of table.

TABLE 9.—*Soil series classified according to the current system of classification and the 1938 system with its later revisions* [1]—Continued

Series	Current classification			Great soil group in 1938 classification
	Family	Subgroup	Order	
Sciotoville	Fine-loamy, mixed, mesic [3]	Aqueptic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Sexton	Fine, montmorillonitic, mesic	Typic Ochraqualfs	Alfisols	Planosols.
Shiloh	Fine-montmorillonitic, noncalcareous, mesic.	Cumulic Haplaquolls	Mollisols	Humic Gley soils.
Starks	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils.
Stoy	Fine-silty, mixed, mesic	Albaquic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils.
Tice	Fine-silty, mixed, mesic	Aquic Fluventic Hapludolls.	Mollisols	Alluvial soils intergrading toward Brunizems.
Uniontown	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Wabash	Fine, montmorillonitic, noncalcareous, mesic.	Vertic Haplaquolls	Mollisols	Humic-Gley soils intergrading toward Alluvial soils.
Wakeland	Coarse-silty, mixed, nonacid, mesic	Aeric Fluventic Haplaquepts.	Inceptisols	Alluvial soils intergrading toward Low-Humic Gley soils.
Wallkill	Fine-loamy, mixed, nonacid, mesic	Thapto-Histic Haplaquepts.	Inceptisols	Alluvial soils intergrading toward Organic soils.
Weinbach [4]	Fine-silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols	Gray-Brown Podzolic soils.
Weir	Fine, montmorillonitic, mesic	Typic Ochraqualfs	Alfisols	Low-Humic Gley soils intergrading toward Planosols.
Wellston	Fine-silty, mixed, mesic	Ultic Hapludalfs	Alfisols	Red-Yellow Podzolic soils.
Worthen	Fine-silty, mixed, mesic	Cumulic Hapludolls	Mollisols	Brunizems intergrading toward Alluvial soils.
Wynoose	Fine, montmorillonitic, mesic	Typic Albaqualfs	Alfisols	Planosols.
Zanesville	Fine-silty, mixed, mesic	Typic Fragiudults	Ultisols	Red-Yellow Podzolic soils.

[1] Placement of some soil series in the current system of classification, particularly in families, may change as more information becomes available.
[2] Classification in subgroup not firm at this time. The typical profile in Gallatin County is an Aquic Hapludalf.
[3] Classification in family not firm at this time.
[4] Some areas of Weinbach soils have a weak fragipan, and the question of fragipan development in the Weinbach series has not been agreed upon at this time. It is probable that in the future, the Weinbach series will be defined as centering on a fragipan, and much of the soil now mapped as Weinbach in this county will be excluded.

Soil characteristics used to separate suborders mainly reflect either the presence or absence of waterlogging, or soil differences produced through the effects of climate or vegetation. The names of suborders contain two syllables, the last of which indicates the order. An example is Aquepts (*Aqu*, meaning water or wet, and *ept*, from Inceptisol).

GREAT GROUP.—Soil suborders are separated into great groups on the basis of uniformity in kinds and sequence of major soil horizons and other features. The horizons used as a basis for distinguishing between great groups and those in which (1) clay, iron, or humus has accumulated; (2) a pan has formed that interferes with growth of roots, movement of water, or both; or (3) a thick, dark-colored surface horizon has developed. The other features commonly used are the self-mulching properties of clay, temperature of the soil, major differences in chemical composition (mainly the bases calcium, magnesium, sodium, and potassium), or the dark-red or dark-brown colors associated with soils formed in material weathered from basic rocks.

Names of the great groups consist of three or four syllables. They are made by adding a prefix to the name of the suborder. An example is Haplaquoll (*Hapl*, meaning usual, and aquoll, meaning soils seasonally saturated with water). The great group is not shown separately in table 9, because it is the last word in the name of the subgroup.

SUBGROUP.—Great groups are subdivided into subgroups. One of these represents the central, or typic, segment of the group. Other subgroups have properties of the group but have one or more properties of another great group, suborder, or order, and these are called intergrades. Also, subgroups may be established for soils having properties that intergrade outside the range of any other great group, suborder, or order. The names of subgroups are formed by placing one or more adjectives ahead of the name of the great group. An example is Cumulic Haplaquolls.

FAMILY.—Families are separated within a subgroup, primarily on the basis of properties that are important to the growth of plants or to the behavior of soils used for engineering. The main properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. The names of families consist of a series of adjectives that precede the name of a subgroup. The adjectives used are the class names for soil texture, mineralogy, and so on (see table 9). An example is the fine-silty, mixed, noncalcareous, mesic family of Cumulic Haplaquolls.

SERIES.—The series consists of a group of soils that formed from a particular kind of parent material and have genetic horizons that, except for texture of the surface soil, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, structure, reaction, consistence, and mineralogical and chemical composition.

New soil series must be established and concepts of some established series, especially older ones that have been used little in recent years, must be revised in the course of the soil survey program across the country. A proposed new series has tentative status until review of the series concepts at State, regional and national levels of responsibility for soil classification results in a judgment that the new series should be established. Most of the soil series described in this publication have been established earlier. Two of the soil series used in this survey had tentative status when the survey was sent to the printer. They are the Emma and Harco series.

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Glossary

Acidity. See Reaction, soil.

Alluvial soil. Soil formed from material, such as gravel, sand, silt, or clay, deposited by a stream of water and showing little or no modification of the original materials by soil-forming processes.

Alluvium. Soil material, such as sand, silt, or clay, that has been transported and deposited by water.

Available moisture capacity (Also called water-holding capacity or moisture-holding capacity). The capacity of a soil to hold water in a form available to plants. The amount of moisture held in soil between the wilting point, or about 15 atmospheres of tension, and the field capacity, or about one-third atmosphere of tension. Classes of available moisture capacity in this survey are the following to a depth of 60 inches:

Very high	12 inches or more.	Low	3 to 6 inches.
High	9 to 12 inches.	Very low	Less than 3 inches.
Moderate	6 to 9 inches.		

Calcareous soil. A soil that contains enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

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.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it and is separated more or less abruptly from the overlying horizon. A claypan commonly is hard when dry and plastic or stiff when wet.

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; will not hold together in a mass.

Friable.—When moist, crushes easily under gentle to moderate 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; tends to stretch somewhat and pull apart, rather than 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, planting, cultivating, and harvesting at right angles to the natural direction of the slope or parallel to the terrace grade.

Contour stripcropping. Growing crops in strips that follow the contour or that are parallel to terraces or diversions; strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production; or a crop grown between trees and vines in orchards and vineyards.

Crop residues. The part of a plant, or crop, left in the field after harvest.

Depth of soil. Thickness of soil over a specified layer, generally one that does not permit the growth of roots. Classes used in this survey are—

Deep	36 inches or more.	Shallow	10 to 20 inches
Moderately deep	20 to 36 inches	Very shallow	Less than 10 inches

Diversion. A broad-bottomed ditch that serves to divert runoff water so that it will flow around the slope to a safe outlet.

Drainage, soil. Internal soil drainage is that quality of a soil that permits the downward flow of water through it. On the basis of runoff, permeability, and internal soil drainage, the following relative soil-drainage classes are described.

Very poorly drained.—The water table remains at or near the surface most of the time.

Poorly drained.—Water is removed so slowly that the soil remains wet much of the time.

Somewhat poorly drained.—Water is removed slowly enough so that the soil is periodically wet and periodically dry. Mottling is commonly present below a depth of 6 to 16 inches in the lower A horizon and in the B and C horizons.

Moderately well drained.—Water is removed somewhat slowly so that the soil is wet for short periods. The soils have uniform color in the A and upper B horizons and have mottling in the lower B and in the C horizons.

Well drained.—Water is removed readily but not rapidly. The soils are nearly free from mottling and are commonly of intermediate texture.

Somewhat excessively drained.—Water is removed rapidly. The soils are very permeable and are free from mottling throughout their profile.

Excessively drained.—The soils are commonly very porous and rapidly permeable, and they have low water-holding capacity.

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 other factors such as light, moisture, temperature, and the physical condition (or tilth) of the soil are favorable.

Fragipan. A dense and brittle pan, or layer, that owes its hardness mainly to extreme density or compactness rather than to content of much clay or cementation. Fragments that are removed are friable, but the material in place is so dense that roots cannot penetrate it and water moves through it very slowly by following vertical channels and cleavage planes.

Glacial drift. Rock material transported by glacial ice and then deposited; also includes the assorted and unassorted materials deposited by streams flowing from glaciers.

Glacial outwash. Cross-bedded gravel, sand, and silt deposited by melt water as it flowed from glacial ice.

Glacial till. Unassorted, unstratified glacial drift consisting of clay, silt, sand, gravel, and boulders transported and deposited by glacial ice.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substance.

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) prismatic or blocky structure; (3) redder or stronger colors than the A horizon; or (4) 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.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils generally indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* contrast—*faint, distinct,* and *prominent.*

Pan. A horizon or layer in soil that is strongly compacted, indurated, or very high in clay content. Frequently the word "pan" is combined with other words that more explicitly indicate the nature of the layers; for example, *claypan, fragipan, hardpan,* and *traffic pan.*

Parent material (soil). The horizon of weathered rock or partly weathered soil material from which the soil has formed; horizon C in the soil profile.

Ped. An individual natural soil aggregate, such as a crumb, prism, or block, in contrast to a clod, which is a mass of soil brought about by digging or other disturbance.

Percent slope. The slant or gradient of a slope stated in percent; for example, a slope of 10 percent is one that changes 10 feet in elevation for each 100 feet horizontal distance.

Permeability, soil. The quality of a soil that enables it to transmit air and water. The following relative classes of soil permeability refer to estimated rates of movement of water in inches per hour through saturated undisturbed cores under a one-half inch head of water:

	Inches per hour		*Inches per hour*
Very slow	Less than 0.06	Moderate	0.63–2.00
Slow	0.06–0.20	Moderately rapid	2.00–6.30
Moderately slow	0.20–0.63	Rapid	6.30–20.00

pH (See Reaction).

Plant nutrients. The elements or groups of elements taken in by the plant, which are essential to its growth and are used by it in the elaboration of its food and tissues. Includes nutrients obtained from the ingredients of fertilizer.

Plow layer. The soil ordinarily moved in tillage; equivalent to surface soil.

Poorly graded sand (soil engineering). Sand that is either predominantly one size material or that contains limited material of more than one size range.

Reaction. The degree of acidity or alkalinity of soil expressed in pH values or in words as follows:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4–7.8
Very strongly acid	4.5–5.0	Moderately alkaline	7.9–8.4
Strongly acid	5.1–5.5	Strongly alkaline	8.5–9.0
Medium acid	5.6–6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1–6.5		
Neutral	6.6–7.3		

Relief. The elevations and inequalities of the land surface, considered collectively.

Sand. As a soil separate, individual rock or mineral fragments in soils having diameters ranging from 0.05 millimeter (0.002 inch) to 2.0 millimeters (0.079 inch) in diameter. As a textural class, soil material that is 85 percent or more of sand and not more than 10 percent clay.

Sedimentary rock. A rock composed of particles deposited from suspension in water. The chief sedimentary rocks are conglomerate, from sand and gravel; sandstone, from sand; shale, from clay; and limestone, from deposits of calcium carbonate. There are many intermediate types. Some wind-deposited sand has consolidated into sandstone.

Silt. As a soil separate individual mineral particles in a soil that range in diameter from the upper limit of clay, 0.002 millimeter (0.000079 inch), to the lower size of very fine sand, 0.05 millimeter (0.002 inch). As a textural class, soil material that is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the surface of the earth that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief over periods of time.

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 soils consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying parent material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

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 principal forms of soil structure are *platy,* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon of soils that have a distinct profile; roughly, the part of the profile below plow depth.

Substratum. Any layer lying beneath the solum, or true soil; the C horizon.

Subsurface layer. As used in this survey, generally a distinct grayish layer below a dark surface layer and above the subsoil and labeled as an A2 horizon in technical soil profile descriptions.

Surface layer. A term used in nontechnical soil descriptions for one or more layers above the subsoil. Generally coincides with the A horizon.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields generally are built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is kept in permanent sod.

Terrace, stream. An area that is fairly level and formerly was the flood plain of a stream but now lies above the present flood plain; the area generally is underlain by stratified stream sediment.

Texture, soil. The relative proportion of sand, silt, and clay particles in a soil. The basic textural classes in increasing proportions 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 subdivided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The physical properties of the soil that affect the ease of cultivating it or its suitability for crops; implies the presence or absence or favorable soil structure.

Topsoil. Soil or soil material, presumably fertile and ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

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.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and the soil series to which the mapping unit belongs.

Dashes in the woodland suitability group column mean that the particular mapping unit is not used as woodland. Other information is given in tables as follows:

Acreage and extent, table 3, p. 13.
Predicted yields, table 4, p. 85.
Recreation groups, table 5, p. 96.

Engineering uses of the soils, tables 6, 7, and 8, pp. 100 through 127.

Map symbol	Mapping unit	Described on page	Management group		Woodland suitability group	
			Symbol	Page	Number	Page
8C2	Hickory loam, 4 to 10 percent slopes, eroded-----	35	IIe-2	75	5	91
8D3	Hickory soils, 7 to 12 percent slopes, severely eroded--	35	IVe-2	81	5	91
8E3	Hickory soils, 12 to 18 percent slopes, severely eroded--	36	VIe-1	83	5	91
8F2	Hickory loam, 18 to 30 percent slopes, eroded----	36	VIe-1	83	5	91
12	Wynoose and Weir silt loams----------------------	72	IIIw-3	80	3	90
13B	Bluford silt loam, 1 to 4 percent slopes---------	25	IIw-3	76	1	89
13C2	Bluford silt loam, 4 to 7 percent slopes, eroded-	26	IIIe-6	79	1	89
14B	Ava silt loam, 2 to 4 percent slopes------------	21	IIe-3	75	4	90
14C	Ava silt loam, 4 to 7 percent slopes------------	21	IIIe-5	79	4	90
14C2	Ava silt loam, 4 to 7 percent slopes, eroded-----	21	IIIe-5	79	4	90
14D3	Ava soils, 7 to 16 percent slopes, severely eroded--	21	IVe-4	82	4	90
28	Jules silt loam----------------------------------	40	I-2	75	--	--
37	Worthen silt loam--------------------------------	71	I-1	75	--	--
53C	Bloomfield fine sand, 1 to 12 percent slopes-----	24	IVs-1	82	8	92
53E	Bloomfield fine sand, 12 to 30 percent slopes----	25	VIIs-1	84	8	92
67	Harpster silty clay loam------------------------	34	IIw-5	77	11	93
70	Beaucoup silty clay loam------------------------	22	IIw-6	77	11	93
71	Darwin silty clay--------------------------------	30	IIIw-5	81	11	93
71+	Darwin silt loam, overwash----------------------	31	IIIw-5	81	11	93
75A	Drury silt loam, 0 to 2 percent slopes-----------	31	I-2	75	2	90
75B	Drury silt loam, 2 to 7 percent slopes-----------	31	IIe-1	75	2	90
83	Wabash silty clay--------------------------------	66	IIIw-5	81	11	93
84	Okaw silt loam-----------------------------------	48	IIIw-3	80	3	90
92	Sarpy sand---------------------------------------	57	VIIs-1	84	8	92
107	Sawmill silty clay loam-------------------------	57	IIw-6	77	--	--
108	Bonnie silt loam---------------------------------	27	IIIw-2	80	10	93
109	Racoon silt loam---------------------------------	53	IIIw-3	80	3	90
131A	Alvin fine sandy loam, 0 to 2 percent slopes-----	19	IIs-1	78	8	92
131B	Alvin fine sandy loam, 2 to 4 percent slopes-----	19	IIe-4	76	8	92
131C2	Alvin fine sandy loam, 4 to 10 percent slopes, eroded--	19	IIIe-2	78	8	92
131D3	Alvin soils, 6 to 12 percent slopes, severely eroded--	20	IVe-1	81	8	92
131E2	Alvin fine sandy loam, 12 to 30 percent slopes, eroded--	20	IVe-1	81	8	92
132A	Starks silt loam, 0 to 2 percent slopes----------	61	IIw-2	76	1	89
132B	Starks silt loam, 2 to 6 percent slopes----------	61	IIw-2	76	1	89
134A	Camden silt loam, 0 to 2 percent slopes----------	28	I-2	75	2	90
134B	Camden silt loam, 2 to 4 percent slopes----------	28	IIe-2	75	2	90
134C2	Camden silt loam, 4 to 10 percent slopes, eroded-	28	IIe-2	75	2	90
134C3	Camden soils, 4 to 7 percent slopes, severely eroded--	29	IIIe-3	79	2	90
134D3	Camden soils, 7 to 20 percent slopes, severely eroded--	29	IVe-2	81	2	90

Map symbol	Mapping unit	Described on page	Management group Symbol	Management group Page	Woodland suitability group Number	Woodland suitability group Page
138	Shiloh silty clay	60	IIw-7	77	11	93
142	Patton silty clay loam	50	IIw-5	77	--	--
164A	Stoy silt loam, 0 to 2 percent slopes	62	IIw-3	76	1	89
164B	Stoy silt loam, 2 to 4 percent slopes	63	IIw-3	76	1	89
173A	McGary silt loam, 0 to 2 percent slopes	46	IIIw-3	80	7	92
173B	McGary silt loam, 2 to 4 percent slopes	46	IIIw-3	80	7	92
173B2	McGary silt loam, 2 to 4 percent slopes, eroded	46	IIIw-3	80	7	92
173C2	McGary silt loam, 4 to 7 percent slopes, eroded	46	IIIe-6	79	7	92
175B	Lamont fine sandy loam, 1 to 4 percent slopes	42	IIIs-1	81	8	92
175C	Lamont fine sandy loam, 4 to 7 percent slopes	42	IIIe-1	78	8	92
175D2	Lamont fine sandy loam, 7 to 12 percent slopes, eroded	42	IIIe-1	78	8	92
176	Marissa silt loam	43	I-1	75	--	--
178	Ruark fine sandy loam	56	IIIw-1	80	3	90
180	Dupo silt loam	32	IIw-4	77	9	93
184A	Roby fine sandy loam, 0 to 2 percent slopes	55	IIs-1	78	8	92
184B	Roby fine sandy loam, 2 to 7 percent slopes	56	IIe-4	76	8	92
190B	Onarga fine sandy loam, 1 to 4 percent slopes	49	IIe-4	76	--	--
190C	Onarga fine sandy loam, 4 to 10 percent slopes	49	IIIe-2	78	--	--
199A	Plano silt loam, 0 to 2 percent slopes	52	I-1	75	--	--
199B	Plano silt loam, 2 to 4 percent slopes	52	IIe-1	75	--	--
208	Sexton silt loam	60	IIIw-3	80	3	90
214B	Hosmer silt loam, 1 to 4 percent slopes	37	IIe-3	75	4	90
214C	Hosmer silt loam, 4 to 7 percent slopes	37	IIIe-5	79	4	90
214C2	Hosmer silt loam, 4 to 7 percent slopes, eroded	37	IIIe-5	79	4	90
214C3	Hosmer soils, 4 to 7 percent slopes, severely eroded	37	IVe-4	82	4	90
214D	Hosmer silt loam, 7 to 12 percent slopes	38	IIIe-5	79	4	90
214D2	Hosmer silt loam, 7 to 12 percent slopes, eroded	38	IIIe-5	79	4	90
214D3	Hosmer soils, 7 to 12 percent slopes, severely eroded	38	IVe-4	82	4	90
214E2	Hosmer silt loam, 12 to 18 percent slopes, eroded	39	IVe-4	82	4	90
214E3	Hosmer soils, 12 to 18 percent slopes, severely eroded	39	VIe-2	83	4	90
284	Tice silty clay loam	63	IIw-6	77	9	93
288	Petrolia silty clay loam	51	IIw-6	77	11	93
306	Allison silty clay loam	18	IIw-6	77	9	93
308B	Alford silt loam, 1 to 4 percent slopes	15	IIe-2	75	5	91
308C2	Alford silt loam, 4 to 7 percent slopes, eroded	15	IIe-2	75	5	91
308C3	Alford soils, 4 to 7 percent slopes, severely eroded	16	IIIe-3	79	5	91
308D2	Alford silt loam, 7 to 12 percent slopes, eroded	16	IIIe-3	79	5	91
308D3	Alford soils, 7 to 12 percent slopes, severely eroded	16	IVe-2	81	5	91
308E2	Alford silt loam, 12 to 18 percent slopes, eroded	16	IVe-2	81	5	91
308E3	Alford soils, 12 to 18 percent slopes, severely eroded	16	VIe-1	83	5	91
308F2	Alford silt loam, 18 to 30 percent slopes, eroded	17	VIe-1	83	5	91
308F3	Alford soils, 18 to 30 percent slopes, severely eroded	17	VIe-1	83	5	91
308G	Alford silt loam, 30 to 60 percent slopes	17	VIIe-1	83	5	91
331	Haymond silt loam	35	I-2	75	9	93
333	Wakeland silt loam	66	IIw-4	77	9	93
334	Birds silt loam	24	IIIw-2	80	10	93

Map symbol	Mapping unit	Described on page	Management group Symbol	Management group Page	Woodland suitability group Number	Woodland suitability group Page
337B	Creal silt loam, 1 to 5 percent slopes	30	IIw-3	76	1	93
339D2	Wellston silt loam, 5 to 12 percent slopes, eroded	69	IVe-4	82	6	89
339E2	Wellston silt loam, 12 to 18 percent slopes, eroded	70	VIe-2	83	6	92
339E3	Wellston soils, 12 to 18 percent slopes, severely eroded	70	VIIe-1	83	6	92
339F2	Wellston silt loam, 18 to 30 percent slopes, eroded	70	VIIe-1	83	6	92
340D2	Zanesville silt loam, 3 to 12 percent slopes, eroded	73	IVe-4	82	4	90
340E2	Zanesville silt loam, 12 to 18 percent slopes, eroded	73	VIe-2	83	4	90
340E3	Zanesville soils, 12 to 18 percent slopes, severely eroded	73	VIIe-1	83	4	90
340F2	Zanesville silt loam, 18 to 30 percent slopes, eroded	74	VIIe-1	83	4	90
382	Belknap silt loam	23	IIw-4	77	9	93
420	Piopolis silty clay loam	51	IIIw-4	80	11	93
426	Karnak silty clay	41	IIIw-4	80	11	93
W426	Karnak silty clay, wet	41	Vw-1	83	12	94
427	Burnside silt loam	27	IIs-2	78	9	93
454B	Iva silt loam, 1 to 4 percent slopes	40	IIw-2	76	1	89
461A	Weinbach silt loam, 0 to 2 percent slopes	68	IIw-3	76	1	89
461B	Weinbach silt loam, 2 to 4 percent slopes	68	IIw-3	76	1	89
462A	Sciotoville silt loam, 0 to 2 percent slopes	58	IIw-1	76	4	90
462B	Sciotoville silt loam, 2 to 4 percent slopes	58	IIe-3	75	4	90
462C2	Sciotoville silt loam, 4 to 7 percent slopes, eroded	58	IIIe-5	79	4	90
462D2	Sciotoville silt loam, 7 to 12 percent slopes, eroded	59	IIIe-5	79	4	90
462E2	Sciotoville silt loam, 12 to 25 percent slopes, eroded	59	IVe-4	82	4	90
W464	Wallkill silty clay loam, wet	67	VIIw-1	84	12	94
465	Montgomery silty clay	47	IIw-7	77	--	--
465+	Montgomery silt loam, overwash	47	IIw-7	77	--	--
467B	Markland silt loam, 1 to 4 percent slopes	44	IIIe-4	79	7	92
467B2	Markland silt loam, 2 to 4 percent slopes, eroded	44	IIIe-4	79	7	92
467C2	Markland silt loam, 4 to 7 percent slopes, eroded	44	IIIe-4	79	7	92
467C3	Markland soils, 4 to 7 percent slopes, severely eroded	44	IVe-3	82	7	92
467D2	Markland silt loam, 7 to 12 percent slopes, eroded	45	IVe-3	82	7	92
467E	Markland silt loam, 12 to 18 percent slopes	45	VIe-2	83	7	92
469A	Emma silty clay loam, 0 to 2 percent slopes	32	IIw-1	76	9	93
469B	Emma silty clay loam, 2 to 6 percent slopes	33	IIe-2	75	9	93
469D2	Emma silty clay loam, 7 to 12 percent slopes, eroded	33	IVe-3	82	9	93
482A	Uniontown silt loam, 0 to 2 percent slopes	64	I-2	75	2	90
482B	Uniontown silt loam, 2 to 4 percent slopes	64	IIe-2	75	2	90
482C2	Uniontown silt loam, 4 to 7 percent slopes, eroded	64	IIe-2	75	2	90
482C3	Uniontown soils, 4 to 7 percent slopes, severely eroded	65	IIIe-3	79	2	90
482D2	Uniontown silt loam, 7 to 16 percent slopes, eroded	65	IIIe-3	79	2	90
482E3	Uniontown soils, 10 to 25 percent slopes, severely eroded	65	VIe-1	83	2	90

Map symbol	Mapping unit	Described on page	Management group		Woodland suitability group	
			Symbol	Page	Number	Page
484	Harco silt loam------------------------------------	33	I-1	75	--	--
723A	Reesville silt loam, 0 to 2 percent slopes-------	54	IIw-2	76	1	89
723B	Reesville silt loam, 2 to 4 percent slopes-------	54	IIw-2	76	1	89
723B2	Reesville silt loam, 2 to 4 percent slopes, eroded--	54	IIw-2	76	1	89
723C2	Reesville silt loam, 4 to 7 percent slopes, eroded--	54	IIIe-3	79	1	89
723C3	Reesville soils, 4 to 7 percent slopes, severely eroded--	55	IVe-2	81	1	89
985D2	Alford-Bold complex, 7 to 12 percent slopes, eroded--	17	IIIe-3	79	5	91
986F2	Wellston-Berks complex, 12 to 60 percent slopes, eroded--	70	VIIe-1	83	6	92

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