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In cooperation with  
Iowa Agriculture and  
Home Economics  
Experiment Station;  
Cooperative Extension  
Service, Iowa State  
University; and Division of  
Soil Conservation, Iowa  
Department of Agriculture  
and Land Stewardship

# Soil Survey of Lucas County, Iowa

## Part I





# How to Use This Soil Survey

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This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, detailed soil map units, and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

On the **general soil map**, the survey area is divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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

The **detailed soil maps** can be useful in planning the use and management of small areas.

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

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

The **Contents** in Part II shows which table has data on a specific land use for each detailed soil map unit. See the **Contents** in Part I and Part II for other sections of this publication that may address your specific needs.

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

Major fieldwork for this soil survey was completed in 1990. Soil names and descriptions were approved in 1991. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1990. This survey was made cooperatively by the Natural Resources Conservation Service; the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship. The survey is part of the technical assistance furnished to the Lucas County Soil and Water Conservation District. Funds appropriated by Lucas County were used to defray part of the cost of the survey.

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

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**Cover: A typical area of Gara and Pershing soils in Red Haw State Park.**

*Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is <http://www.nrcs.usda.gov> (click on "Technical Resources").*

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# Foreword

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

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

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

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

Leroy Brown, Jr.  
State Conservationist  
Natural Resources Conservation Service



# Soil Survey of Lucas County, Iowa

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By Louis E. Boeckman, Natural Resources Conservation Service

Fieldwork by Asghar A. Chowdhery, Stephen J. Ernst, James M. Gertsma,  
Gary L. Hilmer, and Gary L. Lindgren, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,  
in cooperation with  
the Iowa Agriculture and Home Economics Experiment Station; the Cooperative  
Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa  
Department of Agriculture and Land Stewardship

## How This Survey Was Made

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

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

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

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

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

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

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

This soil survey updates the survey of Lucas County, Iowa, published in 1960 (Benton and Prill, 1960). It provides additional information and has larger maps, which show the soils in greater detail.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

## General Nature of the Survey Area

Lucas County is in south-central Iowa (fig. 1). It has an area of 278,300 acres, or 435 square miles. Chariton is the county seat. It is near the center of the county, about 53 miles southeast of Des Moines.

Much of the acreage in the county is farmland that

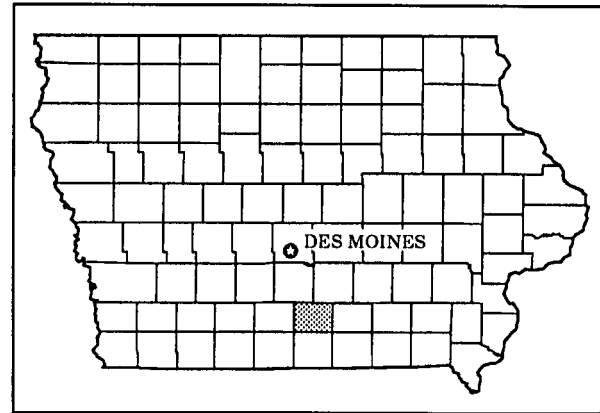


Figure 1.—Location of Lucas County in Iowa.

is used mainly for corn, soybeans, oats, hay, and pasture. A small acreage, mainly around Whitebreast Creek, North Cedar Creek, and the Chariton River, is used as woodland. Corn and soybeans are the main grain crops. Raising livestock, principally hogs and beef, is also an important enterprise.

## History

The first inhabitants of the survey area were the Sac and Fox tribes of the Iowan Indians. In 1843, the area was ceded to the United States for settlement. In 1846, by an act of the Territorial Legislature, it was established as a county. It was named in honor of Robert Lucas, the first Territorial Governor of Iowa (History of Lucas County, 1881).

During the fall of 1846, a few Mormon families settled in an area about 1½ miles southeast of the present-day town of Chariton. They planted crops and lived there for about 2 years. This settlement was later called Chariton Point. The route the Mormons took when they left the county is known as the Mormon Trail Road. It was the terminal for the stage line. Chariton was named after a French trader who established a trading post at the spot where the Chariton River flows into the Missouri River.

The organization of Lucas County government began at Chariton Point in July 1840. In August of 1849, the county seat of Lucas County was established. It was named Polk after President Polk, but the name was later changed to Chariton.

The first permanent settler in Lucas County settled in Cedar Township in the spring of 1847. In 1852, LaGrange was established 11 miles east of Chariton, along the route of U.S. Highway 34. LaGrange was larger than Chariton and served as a stagecoach stop for several years.

When the railroad was constructed in Lucas County in 1867, the towns of Derby, Russell, Oakley, and Lucas were established. Because the railroad was located 2 miles south of the stagecoach route, LaGrange declined and eventually disappeared. With the development of the railroad, the coal mining industry emerged in 1874. Most of the mining occurred in Pleasant Township and near the town of Lucas. John L. Lewis, who later was president of the United Mine Workers of America for 40 years, was born in Lucas in 1880. This town had the distinction of having the first light bulb to be turned on in the State of Iowa. The light bulb was used in a mine, east of Lucas. There were about seven mining camp towns during the years from 1874 through 1930. The largest of these camps were Tipperary and Olmitz. Currently, there is strip mining in the northeastern part of the county.

The first census of the county was taken in 1870. The population increased by nearly 50 percent during the period from 1870 to 1900. Since then, it has been gradually decreasing. It was 6,250 in 1980. The urban population increased significantly from 1885 to 1940 but has steadily declined since that period.

## Farming

The recent trend in the county has been toward a decrease in the number of farms and an increase in the average size of farms. In 1989, there were 680 farms in the county and the average farm size was 369 acres (Iowa Agriculture Statistics, 1990).

Agriculture in the county centers on grain and livestock production. In 1986, corn was planted on 45,000 acres. Of this total, 42,400 acres was harvested for grain and 2,300 acres was used for silage. The average corn grain yield was 117.8 bushels per acre. Hay was grown on 43,100 acres. Soybeans were grown on 27,500 acres, and all but 1,000 acres of this total was harvested for beans. About 11,300 acres was used for oats, and 800 acres was used for wheat.

In 1986, about 74,000 hogs were marketed (Iowa Agriculture Statistics, 1987). The county had 40,000 cows and calves on farms and marketed 3,000 grain-fed beef cattle. There were 600 milk cows on farms. About 4,300 sheep and lambs were on the farms, and 5,600 were marketed.

## Natural Resources

Soil is the most important natural resource in the county. It provides a growing medium for marketable

crops and for the grass grazed by livestock. Another important resource is a limestone quarry, which is in the southern part of the county.

In most years the water supply in Lucas County is adequate for domestic use and for watering livestock. Glacial till and alluvium are the water-bearing sources for shallow wells. Glacial till aquifers are not always reliable because the soils are somewhat impermeable and rainfall tends to run off rather than be absorbed into the ground. Alluvial aquifers are shallow and are dependent on the local rainfall for recharge, and climatic records show patterns of spotty rainfall. Deeper glacial aquifers and bedrock aquifers at a depth of a few hundred feet are highly mineralized. Wells should be monitored periodically for ground-water pollutants. Chariton obtains its water supply from Lake Morris and Ellis City reservoirs. Approximately one-sixth of the county is served by rural water that is supplied by the Rathbun reservoir in Appanoose County to the southeast. Water for livestock is mainly supplied from farm ponds and active running streams.

Wildlife is also a resource in Lucas County. The survey area offers hunting of ring-necked pheasant, bobwhite quail, waterfowl, turkey, squirrel, rabbit, coyote, raccoon, and white-tailed deer. The many farm ponds support bass, bluegills, crappie, catfish, and bullhead, and streams are inhabited by catfish. Furbearing animals are trapped along drainageways and creeks. The county has 2,320 acres of state-owned wildlife areas.

## Transportation Facilities

Three major highways serve Lucas County. U.S. Highway 34 traverses the county from east to west, and State Highway 14 runs north and south. These two highways intersect at Chariton. U.S. Highway 65 traverses the north and south and intersects U.S. Highway 34 at the western edge of Lucas. Hard-surfaced county roads connect these highways to the smaller communities in the county. All farms are along farm-to-market roads surfaced with crushed limestone. There are a few miles of unimproved, unsurfaced roads throughout the county. The major county roads are well distributed throughout the county.

Other transportation facilities include a double-track railroad, which crosses the county from east to west through Russell, Chariton, and Lucas, and a single-track railroad, which crosses the central part of the county from north to south through Chariton and Williamson. A municipal airport is 2 miles west of

Chariton. Scheduled airline transportation is available in Des Moines, which is about 50 miles away. Motor freight lines serve every trading center in the county.

### Physiography, Drainage, and Geology

Lucas County is part of an extensive broad glacial drift plain mantled with loess. The landscape has been modified and altered by the action of streams and their tributaries cutting headward into the divides. The cutting has given the county the broken appearance characteristic of south-central Iowa.

Relief ranges from nearly level to very steep. The topography is characterized by rolling to very steep areas along streams and major drainageways, nearly level to gently rolling upland divides that have retained much of the original surface character, and narrow strips of nearly level flood plains that border most of the creeks and streams.

The northern and northeastern parts of the county are more dissected than the southwestern part. Therefore, the maximum amount of relief is in the northeastern part of the county and the most extensive dissected upland areas are in the western, northern, and northeastern parts.

Lucas County is divided into the Mississippi and Missouri River watersheds, as is indicated by the topographic feature on the upland divide that extends in an east-west direction across the southern part of the county. The elevation of the eastern half of the divide is about the same from the town of Chariton to the eastern side of the county. From Chariton towards the western side of the county, the elevation on this divide increases slightly with distance. Generally, the side slopes of the valley walls along the north side of a major drainage system that flows from east to west are gently sloping, and the side slopes of the valley walls along the south side are steeper.

The valley bottoms are 80 to 160 feet lower than the top of the adjacent upland divides along major drainageways. The highest elevation in the county is 1,106 feet above sea level. This point is about 3 miles southwest of Derby and is near the southwest corner of the county. The lowest elevation is in the northeast corner of the county, where Corruthers Creek flows into Monroe County. It is about 770 feet above sea level. Through the Des Moines River drainage system, the Mississippi River eventually receives about 68 percent of the runoff in Lucas County. The remaining runoff from the southern one-third of the county extending from west to east drains into the Chariton River and eventually into the Missouri River. Whitebreast and Little Whitebreast Creeks flow

northerly. These creeks drain nearly all of the areas west and north of Chariton. South Otter Creek, which flows east and north, drains the northwestern part of the county. The runoff from the east-central and northeastern parts of the county flows into Corruthers, English, North Cedar, and White Creeks. All of these tributaries flow eventually into the Des Moines River. Wolf Creek, in the extreme south-central part of the county, and Honey Creek, in the extreme southeastern part of the county, flow into the Chariton River.

### Climate

The three tables at the end of this section provide climate data for the survey area as recorded at Chariton in the period 1961 to 1990.

In winter, the average temperature is about 24 degrees F and the average daily minimum temperature is about 14 degrees. The lowest temperature on record, which occurred at Chariton on March 1, 1962, is -32 degrees. In summer, the average temperature is 73 degrees. The highest recorded temperature, which occurred at Chariton on July 27, 1956, is 106 degrees.

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

The total annual precipitation is about 37 inches. Of this, 26 inches, or 70 percent, usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 8 inches at Chariton on August 13, 1961. Thunderstorms occur on about 49 days each year, and most occur in June.

The average seasonal snowfall is about 27 inches. The greatest snow depth at any one time during the period of record was 24 inches. On the average, 10 days of the year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 12 inches.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 79 percent. The sun shines 70 percent of the time possible in summer and 51 percent in winter. The prevailing wind is from the northwest. Average windspeed is highest, 13 miles per hour, in April.

Temperature and Precipitation  
(Recorded in the period 1961-90 at Chariton, Iowa)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>Units</u>	<u>In</u>	<u>In</u>	<u>In</u>	<u>In</u>	
January-----	31.7	10.9	21.3	58	-22	6	0.96	0.32	1.49	2	7.0
February-----	37.0	15.5	26.2	66	-20	17	1.08	.49	1.59	3	6.3
March-----	49.5	27.5	38.5	80	-3	122	2.33	.96	3.49	4	4.7
April-----	64.1	39.1	51.6	87	15	364	3.54	1.92	4.97	6	1.8
May-----	74.2	49.2	61.7	90	29	671	4.03	2.41	5.48	7	.0
June-----	82.8	58.4	70.6	96	40	908	4.82	2.52	6.84	7	.0
July-----	87.6	63.3	75.5	99	45	1,095	4.48	1.78	6.75	6	.0
August-----	85.3	60.5	72.9	99	43	1,020	4.08	1.82	6.02	6	.0
September---	77.4	52.5	64.9	93	30	748	4.95	2.28	7.24	6	.0
October-----	66.6	40.9	53.7	87	18	433	2.98	1.10	4.55	5	.1
November-----	50.5	29.4	39.9	74	3	119	2.16	.54	3.44	4	1.8
December-----	35.4	16.4	25.9	64	-16	16	1.36	.61	2.00	3	5.6
Yearly:											
Average---	61.8	38.6	50.2	---	---	---	---	---	---	---	---
Extreme---	---	---	---	100	-25	---	---	---	---	---	---
Total-----	---	---	---	---	---	5,519	36.78	29.75	42.82	59	27.4

\* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

**Freeze Dates in Spring and Fall**  
(Recorded in the period 1961-90 at Chariton, Iowa)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
<b>Last freezing temperature in spring:</b>			
1 year in 10 later than--	Apr. 21	May 3	May 15
2 years in 10 later than--	Apr. 16	Apr. 28	May 10
5 years in 10 later than--	Apr. 8	Apr. 19	May 1
<b>First freezing temperature in fall:</b>			
1 year in 10 earlier than--	Oct. 6	Sept. 27	Sept. 19
2 years in 10 earlier than--	Oct. 12	Oct. 3	Sept. 23
5 years in 10 earlier than--	Oct. 23	Oct. 14	Oct. 2

**Growing Season**

(Recorded in the period 1961-90 at Chariton, Iowa)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	<u>Days</u>	<u>Days</u>	<u>Days</u>
9 years in 10	178	157	138
8 years in 10	184	163	143
5 years in 10	197	176	153
2 years in 10	210	189	164
1 year in 10	216	196	169



# General Soil Map Units

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The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in another but in a different pattern.

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

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

## 1. Grundy-Haig-Arispe Association

### Setting

*Landform:* Uplands  
*Slope range:* 0 to 9 percent

### Composition

*Percent of survey area:* 5  
*Extent of components in the association (fig. 2):*  
Grundy soils—42 percent  
Haig soils—28 percent  
Arispe soils—23 percent  
Soils of minor extent—7 percent

### Soil Characteristics

#### Grundy

*Drainage class:* Somewhat poorly drained  
*Landform:* Uplands  
*Geomorphic component:* Interfluves, head slopes, nose slopes, and side slopes  
*Hillslope position:* Shoulders and summits

*Slope:* 2 to 5 percent  
*Parent material:* Loess

#### Haig

*Drainage class:* Poorly drained  
*Landform:* Upland flats  
*Geomorphic component:* Divides  
*Hillslope position:* Summits  
*Slope:* 0 to 2 percent  
*Parent material:* Loess

#### Arispe

*Drainage class:* Somewhat poorly drained  
*Landform:* Uplands  
*Geomorphic component:* Interfluves, head slopes, nose slopes, and side slopes  
*Hillslope position:* Summits, shoulders, and backslopes  
*Slope:* 5 to 9 percent  
*Parent material:* Loess and glacial till

### Minor Soils

- Clarinda and similar soils
- Edina and similar soils
- Very poorly drained soils in shallow depressions

### Major Uses

- Cropland
- For general and detailed information concerning these uses, see Part II of this publication:
- Agronomy section

## 2. Arispe-Lamoni-Shelby Association

### Setting

*Landform:* Uplands  
*Slope range:* 5 to 25 percent

### Composition

*Percent of survey area:* 30  
*Extent of components in the association (fig. 3):*  
Arispe soils—27 percent  
Lamoni soils—14 percent

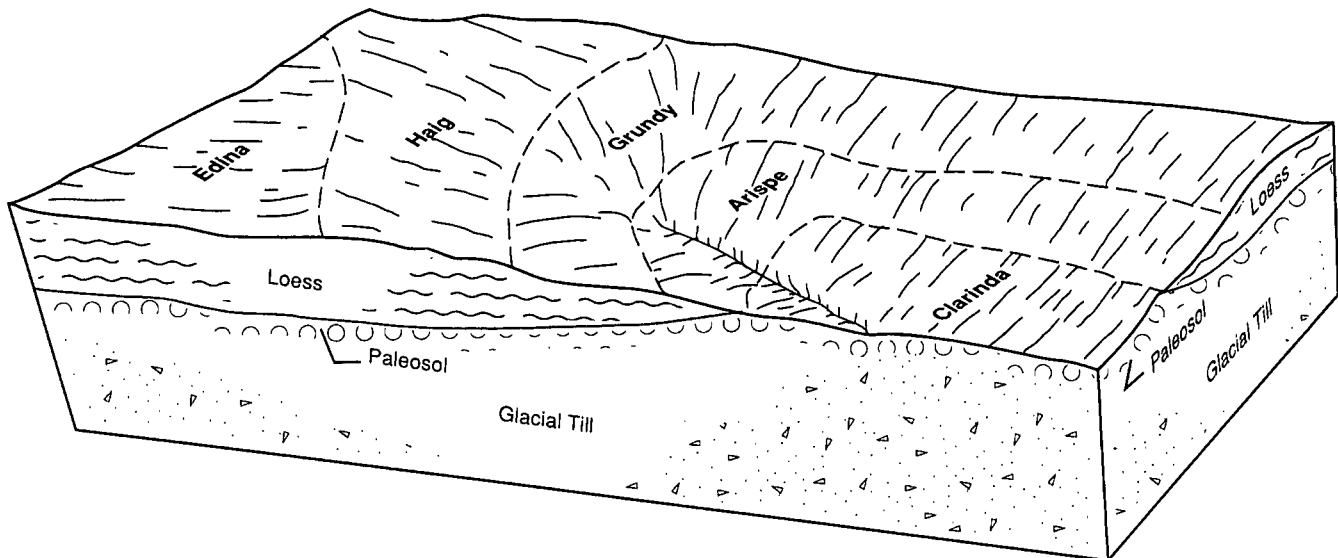


Figure 2.—Typical pattern of soils and parent material in the Grundy-Haig-Arispe association.

Shelby soils—13 percent  
Soils of minor extent—46 percent

#### **Soil Characteristics**

##### **Arispe**

*Drainage class:* Somewhat poorly drained  
*Landform:* Uplands  
*Geomorphic component:* Interfluves, head slopes, nose slopes, and side slopes  
*Hillslope position:* Summits, shoulders, and backslopes  
*Slope:* 5 to 9 percent  
*Parent material:* Loess

##### **Lamoni**

*Drainage class:* Somewhat poorly drained  
*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 5 to 14 percent  
*Parent material:* Gray paleosol weathered from glacial till

##### **Shelby**

*Drainage class:* Well drained  
*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 9 to 25 percent  
*Parent material:* Glacial till

#### **Minor Soils**

- Haig and similar soils
- Grundy and similar soils
- Clarinda and similar soils
- Adair and similar soils
- Zook and similar soils
- Olmitz and similar soils
- Vesser and similar soils

#### **Major Uses**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **3. Gara-Pershing-Armstrong Association**

#### **Setting**

*Landform:* Uplands  
*Slope range:* 2 to 40 percent

#### **Composition**

*Percent of survey area:* 50  
*Extent of components in the association (fig. 4):*  
Gara soils—27 percent  
Pershing soils—17 percent  
Armstrong soils—17 percent

Soils of minor extent—39 percent

**Soil Characteristics**

**Gara**

*Drainage class:* Well drained  
*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 14 to 40 percent  
*Parent material:* Glacial till

**Pershing**

*Drainage class:* Somewhat poorly drained  
*Landform:* Uplands and stream terraces  
*Geomorphic component:* Interfluves, head slopes, nose slopes, and side slopes  
*Hillslope position:* Summits, shoulders, and backslopes  
*Slope:* 2 to 14 percent  
*Parent material:* Loess

**Armstrong**

*Drainage class:* Moderately well drained  
*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 5 to 14 percent  
*Parent material:* Red paleosol weathered from glacial till

**Minor Soils**

- Bucknell and similar soils
- Grundy and similar soils
- Mystic and similar soils
- Vesser and similar soils
- Zook and similar soils
- Olmitz and similar soils

**Major Uses**

- Cropland
- Hayland
- Pasture

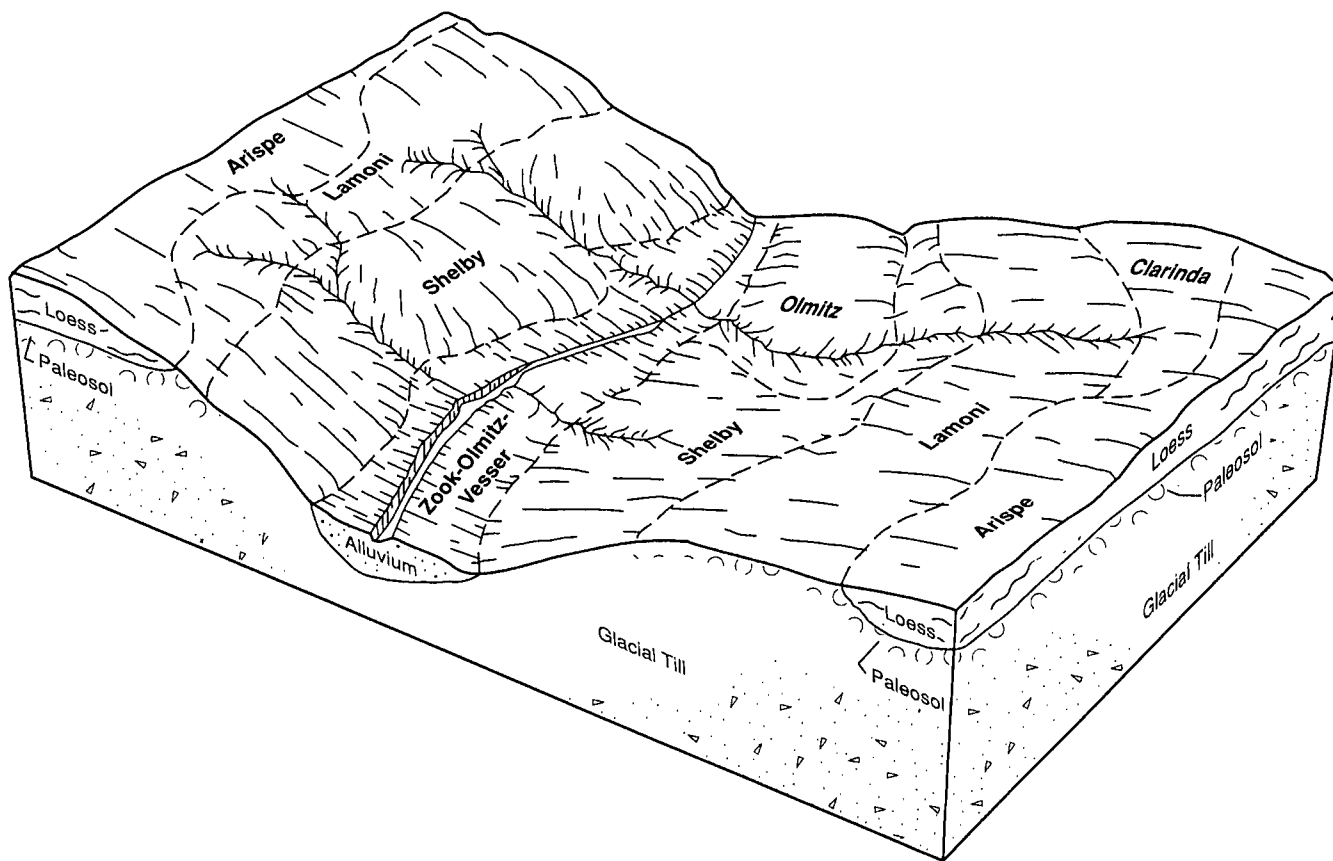


Figure 3.—Typical pattern of soils and parent material in the Arispe-Lamoni-Shelby association.

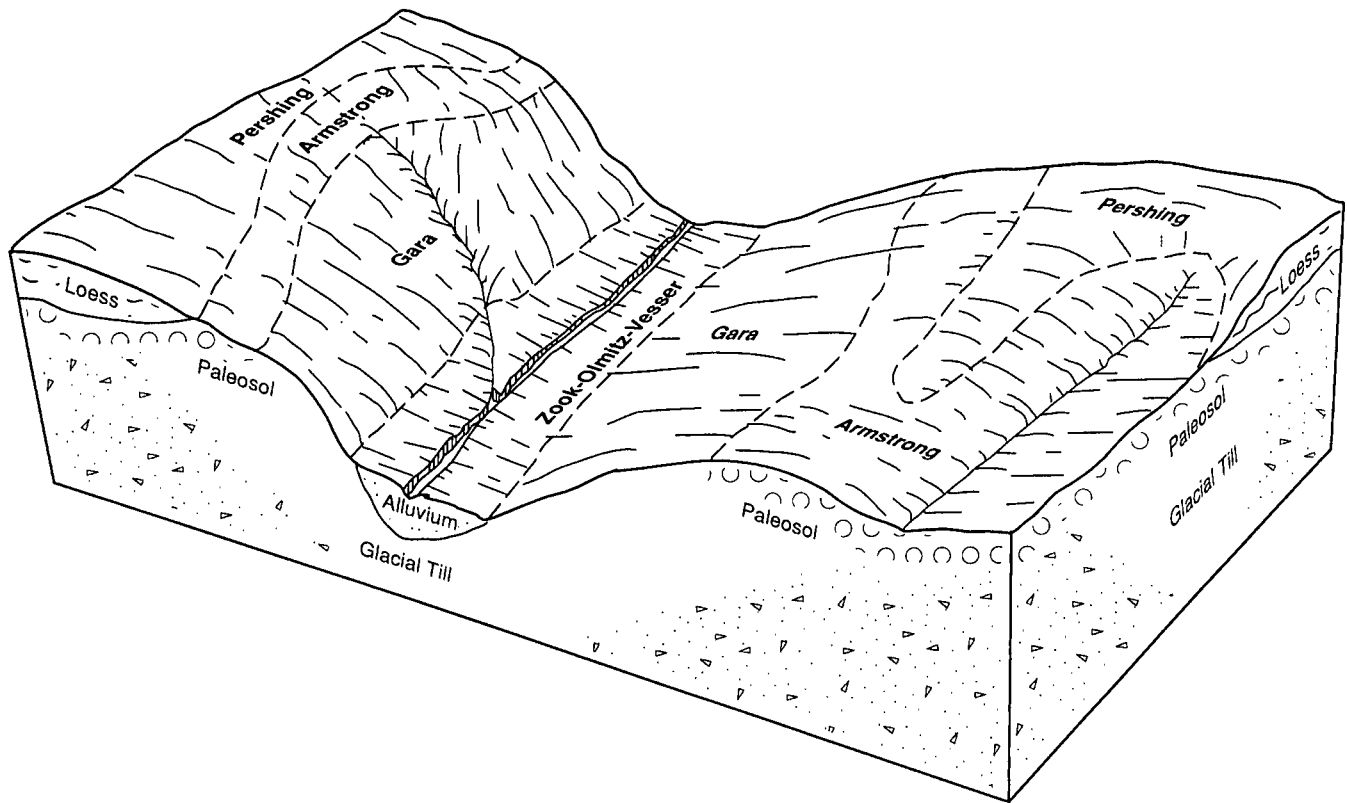


Figure 4.—Typical pattern of soils and parent material in the Gara-Pershing-Armstrong association.

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

#### 4. Lindley-Keswick-Weller Association

##### **Setting**

*Landform:* Uplands

*Slope range:* 2 to 40 percent

##### **Composition**

*Percent of survey area:* 9

*Extent of components in the association (fig. 5):*

Lindley soils—34 percent

Keswick soils—24 percent

Weller soils—13 percent

Soils of minor extent—29 percent

##### **Soil Characteristics**

###### **Lindley**

*Drainage class:* Well drained

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 14 to 40 percent

*Parent material:* Glacial till

###### **Keswick**

*Drainage class:* Moderately well drained

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 5 to 14 percent

*Parent material:* Red paleosol

###### **Weller**

*Drainage class:* Moderately well drained

*Landform:* Uplands

*Geomorphic component:* Interfluves, head slopes, nose slopes, and side slopes

*Hillslope position:* Summits, shoulders, and backslopes

*Slope:* 2 to 14 percent

*Parent material:* Loess

**Minor Soils**

- Gosport and similar soils
- Nodaway and similar soils
- Vesser and similar soils

**Major Uses**

- Pasture
- Hayland
- Woodland
- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Woodland section
- Wildlife Habitat section

**5. Nodaway-Zook-Lawson Association**

**Setting**

*Landform:* Flood plains  
*Slope range:* 0 to 2 percent

**Composition**

*Percent of survey area:* 6

*Extent of components in the association:*

- Nodaway soils—38 percent
- Zook soils—27 percent
- Lawson soils—10 percent
- Soils of minor extent—25 percent

**Soil Characteristics**

**Nodaway**

*Drainage class:* Moderately well drained  
*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Parent material:* Alluvium

**Zook**

*Drainage class:* Poorly drained  
*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Parent material:* Alluvium

**Lawson**

*Drainage class:* Somewhat poorly drained  
*Landform:* Flood plains  
*Slope:* 0 to 2 percent  
*Parent material:* Alluvium

**Minor Soils**

- Ackmore and similar soils

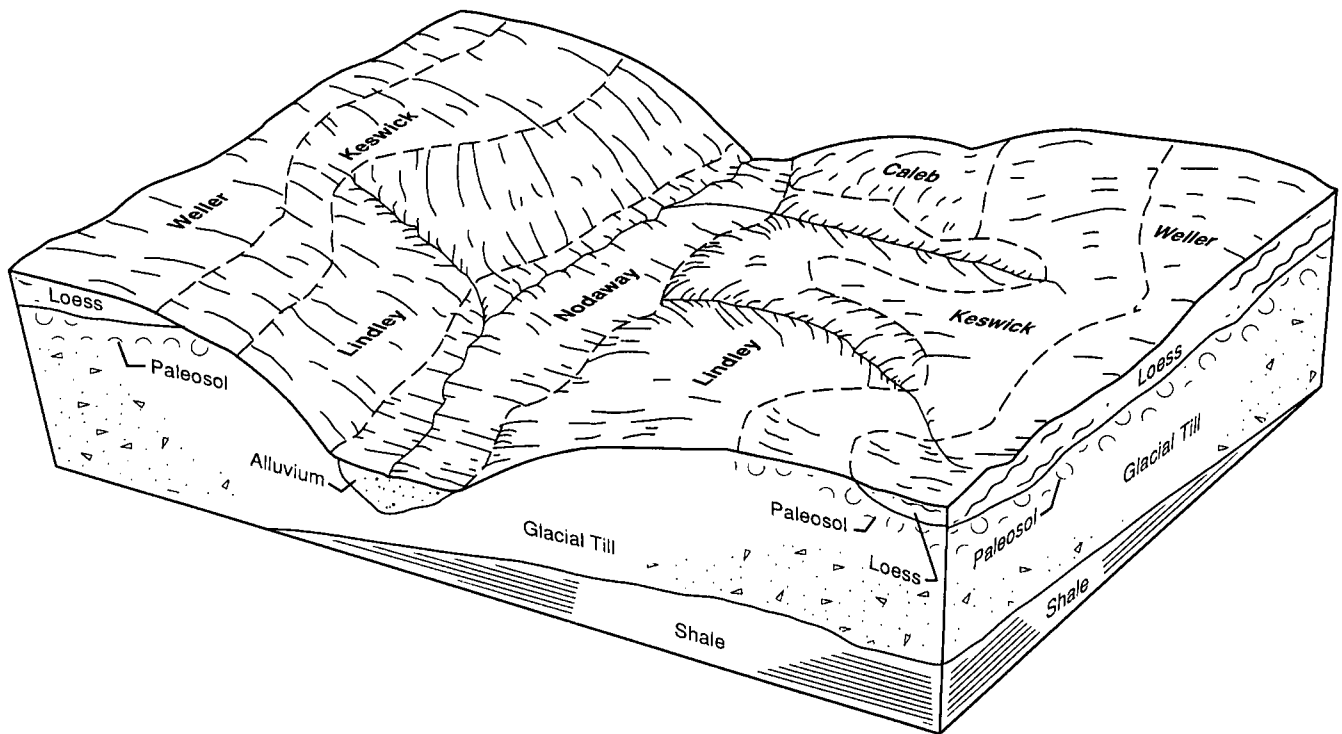


Figure 5.—Typical pattern of soils and parent material in the Lindley-Keswick-Weller association.

- Chequest and similar soils
- Humeston and similar soils
- Vesser and similar soils

***Major Uses***

- Cropland
- Pasture
- Woodland

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Woodland section
- Wildlife Habitat section

# Formation and Classification of the Soils

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This section relates the soils in the survey area to the major factors of soil formation and describes the system of soil classification.

## Formation of the Soils

The factors of soil formation and their effect on the soils in Lucas County are described in this section. The processes of soil formation that result in the formation of soil horizons are also described. Detailed descriptions of profiles typical of the series are given in the section "Soil Series and Detailed Soil Map Units."

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material (Jenny, 1941). Human activities also affect soil formation.

Climate and vegetation are the active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. Some time is always needed for horizon differentiation. A long period generally is needed for the formation of distinct horizons. The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the others.

## Climate

The soils in Lucas County formed under the influence of a midcontinental climate for at least

3,000 years (Ruhe, 1956b). The morphology and properties of most of the soils indicate that this climate was similar to the present climate. Between 30,000 and 11,000 years ago, the climate was cooler and moist and favored the growth of coniferous forest vegetation. As the climate warmed, deciduous forest invaded. This type of forest vegetation persisted until about 9,000 years ago. Since that time, the climate has been characterized by further warming and greater dryness. Under these climatic conditions the dominant vegetation has been mixed prairie grasses and deciduous forest.

The general climate has had an important overall influence on the characteristics of the soils, but it has not caused major differences among them. The influence of general climate in a region is modified by local conditions. For example, the soils on south-facing slopes formed under a microclimate that is warmer and drier than that of soils in nearby areas. Also, the low lying, poorly drained soils on flood plains formed under a microclimate that is wetter and colder than that of most of the surrounding soils. Local conditions account for some of the differences among soils in the county.

Changes in temperature activate the weathering of parent material by water and air. As the parent material weathers, changes caused by physical and chemical actions take place. Rainfall affects the amount of leaching in the soil and the kinds of plants on the soil. Temperature and other climatic factors indirectly affect soil formation through their effect on plant and animal life on and in the soil.

## Living Organisms

Plant and animal life has an important effect on the formation of soils. Plant life is especially significant because it helps to initiate soil formation. Different kinds of plant life have a marked influence on the differences among soils.

The soils of Lucas County appear to have been influenced in recent times by two main kinds of plant life—prairie grasses and deciduous trees. The main prairie grasses were big bluestem, little bluestem, and indiagrass. The trees were mainly

oak, hickory, ash, elm, maple, and other deciduous trees.

The native grasses, which have many roots and tops, have decayed in or on the soil and thus have added large amounts of organic matter to the surface layer of some soils. As a result, these soils have a thicker dark surface layer than soils that formed under trees.

The soils that formed under mixed grasses and trees have properties of soils that formed only under grasses and of soils that formed only under trees.

Grundy, Haig, and Shelby soils are typical of soils that formed under prairie grasses. Weller and Lindley soils are typical of soils that formed under trees (Prill and Riecken, 1958). Gara and Pershing soils are typical of soils that formed under mixed grasses and trees. They have properties intermediate between those of soils that formed only under grasses and those that formed only under trees.

Grundy, Pershing, and Weller soils are members of a biosequence, which is a group of soils that formed in the same parent material and under a similar climate but have supported different kinds of native vegetation. Grundy soils formed under prairie grasses, Pershing soils formed under mixed grasses and trees, and Weller soils formed under trees. The main morphological differences among the three soils are the result of the different kinds of native vegetation.

The activities of burrowing animals and insects tend to loosen and aerate the upper few feet of soil.

## Relief

Relief has an important influence on the formation of soils. It indirectly affects soil formation through its influence on drainage. In Lucas County, relief ranges from level to very steep. In many areas on bottom land, the nearly level soils are occasionally flooded and have a permanently or periodically high water table. In depressions, water soaks into the nearly level soils that are subject to flooding. Much of the rainfall runs off the steep soils on uplands.

Level soils are on the broad upland flats and on the stream bottoms. The steepest soils in the county are generally on the southern and western sides of the major streams and their tributaries. The intricate pattern of upland drainageways indicates that the landscape in most of the county has been modified by geologic processes.

Haig soils, which formed in areas where the water table is high, have a dominantly grayish subsoil. Grundy and Pershing soils formed in areas where the water table fluctuated and was periodically high.

Gara, Lindley, and Shelby soils and other soils that formed in areas where the water table was below the subsoil have a yellowish brown subsoil. Haig soils formed under prairie grasses and have a high water table. They contain more organic matter in the surface layer than well drained soils that formed under prairie grasses. Clay accumulates in the subsoil of Edina soils and other soils in slight depressions or in nearly level areas. A large amount of water enters the soils and carries the clay particles downward. Edina soils are commonly considered "claypan" soils because they have a very slowly permeable subsoil, in which a great amount of clay accumulates.

Pershing and Weller soils were studied to determine the effects of relief on the formation of soils. From the stable slopes to the unstable slopes where these soils occur, tests showed an increase in content of clay in the A horizon and a decrease in thickness of the A horizon. Soil formation is more pronounced on the more stable slopes.

In Gara, Lindley, Shelby, and similar soils that have a wide range in slope and are on many different kinds of slopes, the depth to carbonates is shallowest where the slopes are steepest, are convex, or are most unstable.

## Parent Material

The accumulation of parent material is the first step in the formation of a soil. All of the soils in Lucas County formed in material that was transported from the site of the parent rock and redeposited at a new location through the action of glacial ice, water, wind, and gravity. The principal parent materials in Lucas County are glacial till, loess, and alluvium. The various geologic depositions and subsequent erosion by streams have resulted in the formation of moderately broad, nearly level and gently sloping ridgetops. The soils that formed in loess are on these ridgetops. The moderately sloping to very steep soils on side slopes formed in loess and glacial till. The soils on flood plains along streams formed in alluvium (fig. 6).

Glacial till is unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glacial till is the most extensive parent material in the county. It covers about 46 percent of the surface area. It is exposed in all parts of the county, and on steep slopes it forms a major part of the landscape. The unweathered till is firm, calcareous clay loam. It contains pebbles, boulders, and sand as well as silt and clay. The till is a heterogeneous mixture and



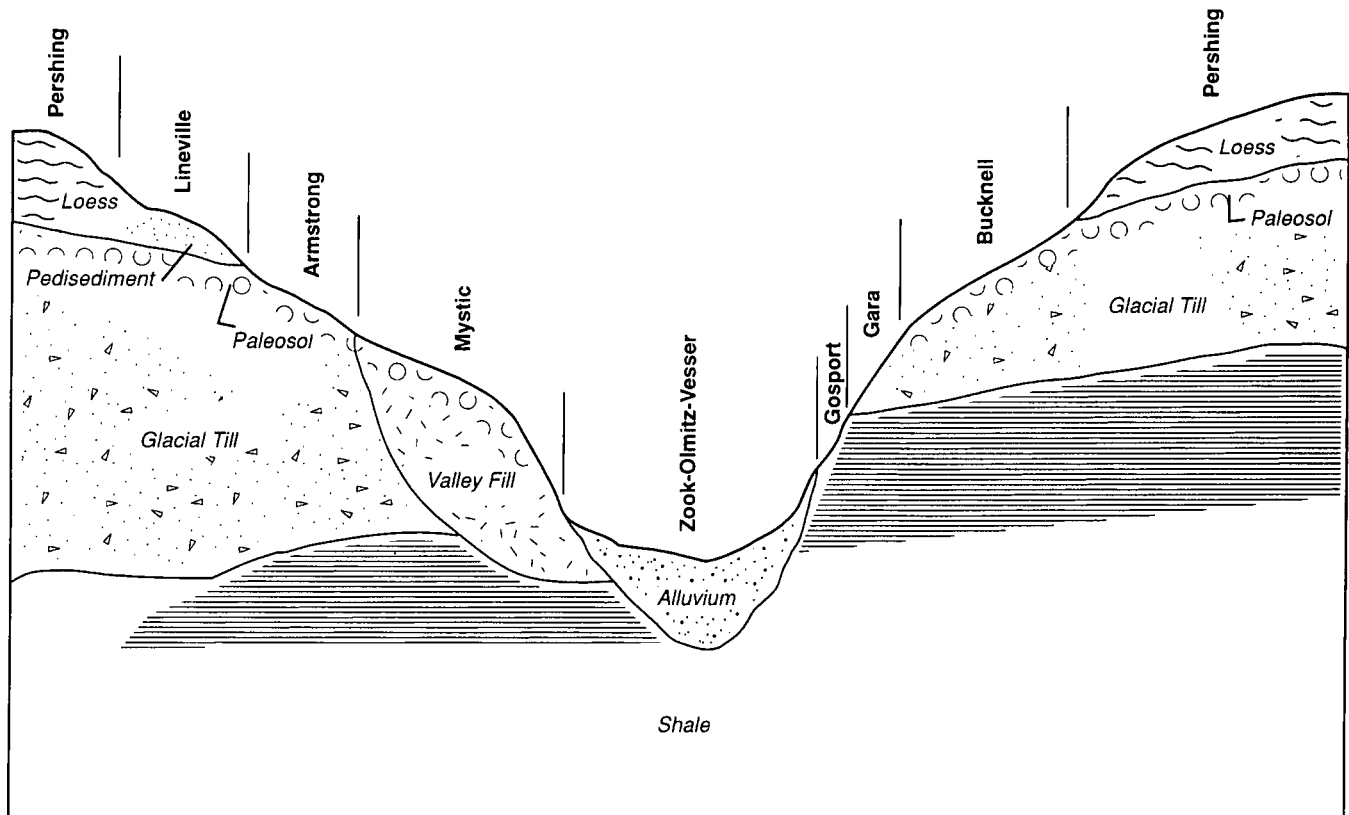


Figure 6.—Relationship of the major soils in Lucas County to parent material and to position on the landscape.

shows little evidence of sorting or stratification. The mineral composition of its components is also heterogeneous and is similar to that of particles in unweathered loess. The thickness of the glacial till ranges to more than 300 feet in places.

At least two major glaciations during the Pleistocene Epoch affected Lucas County. The Nebraskan Glaciation occurred about 750,000 years ago (Kay and Graham, 1943; Simonson, 1959). It was followed by the combined Yarmouth and Sangamon interglacial periods. As the glaciers retreated, they left behind a vast deposit of glacial till.

Nebraskan till is in a few places in the county. Kansan till is exposed on the steeper slopes in all parts of the county. This till forms an extensive part of the landscape.

The Aftonian paleosol formed on the Nebraskan till plain during the Aftonian interglacial period before the Kansas Glaciation. This paleosol is strongly weathered, gray clay that is very slowly permeable. It ranges from a few feet to several feet in thickness.

Soils formed on the Kansas till plain during the combined Yarmouth and Sangamon interglacial

periods before the loess was deposited (Ruhe, 1968). In nearly level areas the soils were strongly weathered and have a thick, gray, plastic, clayey subsoil called "gumbotil." These soils are also called paleosols, or "ancient soils" (Ruhe, 1956b; Ruhe and Daniels, 1958). The Yarmouth-Sangamon paleosol (gumbotil) is several feet thick and is very slowly permeable. Clarinda and Rinda soils formed in this paleosol. They are extensive throughout Lucas County. Bucknell and Lamoni soils formed in the truncated Yarmouth-Sangamon paleosol. The clayey layer in these soils is not as thick as that in the Clarinda soils. Lamoni soils are extensive throughout Lucas County.

Late in the Sangamon interglacial period, geologic erosion cut through the Yarmouth-Sangamon paleosol and into the Kansan till. At the depth to which this erosion has cut, a stone line or subjacent till generally is overlain by pedisediment (Ruhe, 1956a; Ruhe, 1956b; Ruhe, 1959). A paleosol formed in this material. Geologic erosion removed the loess from any slopes and left the paleosol exposed on the surface. The late Sangamon paleosol generally is

reddish and is thinner than the Yarmouth-Sangamon paleosol. Adair, Armstrong, and Keswick soils formed in the late Sangamon paleosol.

Caleb and Mystic soils formed in pre-Sangamon sediments of valley fills. These sediments are of glacial origin and vary in texture (Ruhe, 1956b). They are on low-stepped interfluvial areas above the present valley floor. They are on a landscape that is partly valley fill, but their surface merges with the present erosional uplands. The Caleb and Mystic soils are above the flood plain, but they are lower than the Gara, Lindley, and Shelby soils, which formed in Kansan till on dissected slopes of late Wisconsinan age. Gara, Lindley, and Shelby soils are extensive in Lucas County.

Loess, a silty material deposited by the wind, covers about 27 percent of the county. It was deposited during the Wisconsinan glacial period between 29,000 to 14,000 years ago (Hutton, 1947). It consists mostly of silt and some clay. It also contains small amounts (generally less than 5 percent) of fine sand and very fine sand. The major source of loess in Lucas County was probably the flood plains along the Missouri River and its tributaries in the western part of Iowa. The thickness of the loess and the content of clay in the loess are related to the distance from the source of the loess.

The thickness of the loess in Lucas County ranges from 8 to 12 feet on the stable upland divides. It is thinner on side slopes and in narrow, low interfluvial areas. The loess is slightly thicker in the northwestern part of the county. It also occurs in the rest of the county, in areas where Arispe, Edina, Grundy, Haig, Pershing, and Weller soils formed. Lineville soils formed in 10 to 20 inches of loess over glacial sediments underlain by a late Sangamon paleosol weathered from glacial till.

Alluvium is sediment deposited by water along major and minor streams and drainageways. It is also on low stream terraces. It covers about 18 percent of the county. The texture of alluvium varies widely because of the source of the material and the manner in which it was deposited. Loess and glacial till are the main sources of alluvium in Lucas County.

Alluvial sediment is the parent material of soils on flood plains and terraces and in drainageways. As the streams overflow their channels, they deposit alluvium. The coarser or larger particles are deposited closer to the stream channel or in and along the main path of the floodwater. The finer particles are deposited in areas farther away from the stream channel, where the floodwater moves slowly or is still. Ackmore, Lawson, Nodaway, and Zook soils formed in silty alluvium. These soils are mainly

on the flood plains along the Chariton River, Whitebreast Creek, and Otter Creek. Humeston and Vesser soils are on low stream terraces. They are less subject to overflow than other soils that formed in alluvium and thus show more profile development.

Colluvium is sediment deposited on or at the base of steep slopes by mass wasting and local, unconcentrated runoff. It retains many characteristics of soils on the slopes from which it is eroded. Olmitz soils formed in colluvium on foot slopes of till-derived soils.

Bedrock is the oldest parent material in the county. It is made up of a series of beds deposited during the Des Moines sedimentary cycle in the Pennsylvania period. These beds consist of limestone, shale of different colors and textures, conglomerate, and a few organic layers, such as coal. The thickness of these layers, or beds, varies widely. In Lucas County, coal veins are generally 50 to 100 feet below the surface. However, some are exposed on the surface.

Observations of roadbanks and cuts in the survey area showed 4 to 6 layers of shale and limestone exposed on the present land surface. The layer of lime rock commonly exposed is about 3 to 5 feet thick and has gray or brown shale above and below. Fragments of the lime rock layer are commonly on the surface of the side slope below outcroppings. These materials outcrop mainly on slopes along the lower part of tributaries of the Chariton River and Whitebreast Creek, north and west of Chariton, and along the lower part of Shoal and Cedar Creeks and their tributaries in the northeastern part of the county.

Gosport soils formed in brownish and grayish shales.

## Time

The length of time that the soil material is acted upon by soil-forming processes affects the kind of soil that forms. The older soils have strongly expressed genetic horizons. Some soils on flood plains show little or no evidence of soil formation because they have not been in place long enough for the development of distinct horizons. Nodaway soils are examples.

An older soil generally has a higher content of clay in the subsoil than a younger soil forming in a similar parent material. As a soil forms, clay is moved from the surface layer to the subsoil. This transfer increases the content of clay in the subsoil. It is more evident in nearly level soils than in the more sloping soils.

In the steeper areas the soil material is generally removed before enough time has passed for the

development of a thick profile that has distinct horizons. Even if the soil material has been in place a long time, the soil still exhibits little development because much of the water runs off the slopes rather than through the soil material. Gara, Lindley, and Shelby soils formed on recently dissected slopes of late Wisconsinan age (Ruhe, 1959; Ruhe, 1956b).

## Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The table "Classification of the Soils" in Parts I and II of this publication shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

**ORDER.** Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

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

**GREAT GROUP.** Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is

identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that has an aquatic moisture regime).

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

**FAMILY.** Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, montmorillonitic, mesic Typic Haplaquolls.

**SERIES.** The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

## Classification of the Soils

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Ackmore-----	Aeric Fluvaquents, fine-silty, mixed, nonacid, mesic
*Adair-----	Aquic Argiudolls, fine, montmorillonitic, mesic
Arispe-----	Aquic Argiudolls, fine, montmorillonitic, mesic
Armstrong-----	Aquollic Hapludalfs, fine, montmorillonitic, mesic
Bucknell-----	Udollic Ochraqualfs, fine, montmorillonitic, mesic, sloping
Caleb-----	Mollic Hapludalfs, fine-loamy, mixed, mesic
Chequest-----	Typic Haplaquolls, fine, montmorillonitic, mesic
Clarinda-----	Typic Argiaquolls, fine, montmorillonitic, mesic, sloping
Edina-----	Typic Argialbolls, fine, montmorillonitic, mesic
Gara-----	Mollic Hapludalfs, fine-loamy, mixed, mesic
Gosport-----	Typic Dystrachrepts, fine, illitic, mesic
Grundy-----	Aquertic Argiudolls, fine, montmorillonitic, mesic
Haig-----	Typic Argiaquolls, fine, montmorillonitic, mesic
Humeston-----	Argiaquic Argialbolls, fine, montmorillonitic, mesic
Keswick-----	Aquic Hapludalfs, fine, montmorillonitic, mesic
Lamoni-----	Aquic Argiudolls, fine, montmorillonitic, mesic
Lawson-----	Cumulic Hapludolls, fine-silty, mixed, mesic
Lindley-----	Typic Hapludalfs, fine-loamy, mixed, mesic
Lineville-----	Aquollic Hapludalfs, fine-loamy, mixed, mesic
Mystic-----	Aquollic Hapludalfs, fine, montmorillonitic, mesic
Nodaway-----	Mollic Udifluvents, fine-silty, mixed, nonacid, mesic
Olmitz-----	Cumulic Hapludolls, fine-loamy, mixed, mesic
Pershing-----	Aquollic Hapludalfs, fine, montmorillonitic, mesic
Rinda-----	Mollic Ochraqualfs, fine, montmorillonitic, mesic, sloping
Shelby-----	Typic Argiudolls, fine-loamy, mixed, mesic
Tuskeego-----	Mollic Ochraqualfs, fine, montmorillonitic, mesic
Vesser-----	Argiaquic Argialbolls, fine-silty, mixed, mesic
Wabash-----	Vertic Haplaquolls, fine, montmorillonitic, mesic
Weller-----	Aquic Hapludalfs, fine, montmorillonitic, mesic
Zook-----	Cumulic Haplaquolls, fine, montmorillonitic, mesic

## Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
13B	Zook-Olmitz-Vesser complex, 0 to 5 percent slopes-----	21,800	7.8
23C	Arispe silty clay loam, 5 to 9 percent slopes-----	3,975	1.4
23C2	Arispe silty clay loam, 5 to 9 percent slopes, moderately eroded-----	21,925	7.9
24D	Shelby clay loam, 9 to 14 percent slopes-----	210	*
24D2	Shelby clay loam, 9 to 14 percent slopes, moderately eroded-----	3,075	1.1
24E2	Shelby clay loam, 14 to 18 percent slopes, moderately eroded-----	4,340	1.6
24E3	Shelby clay loam, 14 to 18 percent slopes, severely eroded-----	285	0.1
24F2	Shelby clay loam, 18 to 25 percent slopes, moderately eroded-----	915	0.3
51	Vesser silt loam, 0 to 2 percent slopes-----	930	0.3
51+	Vesser silt loam, 0 to 2 percent slopes, overwash-----	355	0.1
51B	Vesser silt loam, 2 to 5 percent slopes-----	935	0.3
51B+	Vesser silt loam, 2 to 5 percent slopes, overwash-----	445	0.2
54	Zook silty clay loam, 0 to 2 percent slopes-----	2,595	0.9
54+	Zook silt loam, 0 to 2 percent slopes, overwash-----	1,320	0.5
54B	Zook silty clay loam, 2 to 5 percent slopes-----	790	0.3
65E	Lindley loam, 14 to 18 percent slopes-----	205	*
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded-----	425	0.2
65F	Lindley loam, 18 to 25 percent slopes-----	2,715	1.0
65F2	Lindley loam, 18 to 25 percent slopes, moderately eroded-----	4,645	1.7
65G	Lindley loam, 25 to 40 percent slopes-----	2,390	0.9
65G2	Lindley loam, 25 to 40 percent slopes, moderately eroded-----	3,345	1.2
93D2	Shelby-Adair complex, 9 to 14 percent slopes, moderately eroded-----	1,470	0.5
94D2	Mystic-Caleb complex, 9 to 14 percent slopes, moderately eroded-----	2,145	0.8
94E2	Mystic-Caleb complex, 14 to 18 percent slopes, moderately eroded-----	1,035	0.4
131B	Pershing silt loam, 2 to 5 percent slopes-----	1,925	0.7
131C	Pershing silt loam, 5 to 9 percent slopes-----	6,935	2.5
131C2	Pershing silty clay loam, 5 to 9 percent slopes, moderately eroded-----	11,200	4.0
131D2	Pershing silty clay loam, 9 to 14 percent slopes, moderately eroded-----	520	0.2
132B	Weller silt loam, 2 to 5 percent slopes-----	230	*
132C	Weller silt loam, 5 to 9 percent slopes-----	1,245	0.4
132C2	Weller silty clay loam, 5 to 9 percent slopes, moderately eroded-----	1,585	0.6
132D2	Weller silty clay loam, 9 to 14 percent slopes, moderately eroded-----	305	0.1
172	Wabash silty clay, 0 to 2 percent slopes-----	455	0.2
179D2	Gara clay loam, 9 to 14 percent slopes, moderately eroded-----	1,680	0.6
179E	Gara loam, 14 to 18 percent slopes-----	870	0.3
179E2	Gara clay loam, 14 to 18 percent slopes, moderately eroded-----	14,985	5.4
179E3	Gara clay loam, 14 to 18 percent slopes, severely eroded-----	205	*
179F	Gara loam, 18 to 25 percent slopes-----	2,355	0.8
179F2	Gara clay loam, 18 to 25 percent slopes, moderately eroded-----	15,400	5.5
179G2	Gara clay loam, 25 to 40 percent slopes, moderately eroded-----	710	0.3
192C2	Adair clay loam, 5 to 9 percent slopes, moderately eroded-----	3,125	1.1
192D2	Adair clay loam, 9 to 14 percent slopes, moderately eroded-----	1,730	0.6
211	Edina silt loam, depressionnal, 0 to 1 percent slopes-----	2,160	0.8
220	Nodaway silt loam, 0 to 2 percent slopes-----	6,440	2.3
222C	Clarinda silty clay loam, 5 to 9 percent slopes-----	695	0.2
222C2	Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded-----	7,660	2.8
222C3	Clarinda silty clay loam, 5 to 9 percent slopes, severely eroded-----	765	0.3
222D2	Clarinda silty clay loam, 9 to 14 percent slopes, moderately eroded-----	785	0.3
223C2	Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded-----	460	0.2
223D2	Rinda silty clay loam, 9 to 14 percent slopes, moderately eroded-----	430	0.2
269	Humeston silty clay loam, 0 to 2 percent slopes-----	1,135	0.4
269+	Humeston silt loam, 0 to 2 percent slopes, overwash-----	355	0.1
273B	Olmitz loam, 2 to 5 percent slopes-----	700	0.3
273C	Olmitz loam, 5 to 9 percent slopes-----	565	0.2
313D2	Gosport silty clay loam, 9 to 14 percent slopes, moderately eroded-----	395	0.1
313E2	Gosport silty clay loam, 14 to 18 percent slopes, moderately eroded-----	935	0.3
313F	Gosport silt loam, 18 to 25 percent slopes-----	225	*
313F2	Gosport silty clay loam, 18 to 25 percent slopes, moderately eroded-----	1,225	0.4
362	Haig silt loam, 0 to 2 percent slopes-----	13,675	4.9
364B	Grundy silty clay loam, 2 to 5 percent slopes-----	20,435	7.3

See footnote at end of table.

## Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
423C2	Bucknell silty clay loam, 5 to 9 percent slopes, moderately eroded-----	1,220	0.4
423D	Bucknell silty clay loam, 9 to 14 percent slopes-----	305	0.1
423D2	Bucknell silty clay loam, 9 to 14 percent slopes, moderately eroded-----	6,800	2.4
425D	Keswick loam, 9 to 14 percent slopes-----	2,180	0.8
425D2	Keswick clay loam, 9 to 14 percent slopes, moderately eroded-----	4,085	1.5
430	Ackmore silt loam, 0 to 2 percent slopes-----	1,195	0.4
451D2	Caleb loam, 9 to 14 percent slopes, moderately eroded-----	245	*
451E2	Caleb loam, 14 to 18 percent slopes, moderately eroded-----	420	0.2
452C	Lineville silt loam, 5 to 9 percent slopes-----	535	0.2
452C2	Lineville silt loam, 5 to 9 percent slopes, moderately eroded-----	250	*
453	Tuskeego silt loam, 0 to 2 percent slopes-----	310	0.1
470D2	Lamoni-Shelby complex, 9 to 14 percent slopes, moderately eroded-----	2,990	1.1
484	Lawson silt loam, 0 to 2 percent slopes-----	470	0.2
587	Chequest silty clay loam, 0 to 2 percent slopes-----	555	0.2
587+	Chequest silt loam, 0 to 2 percent slopes, overwash-----	280	0.1
592C2	Mystic clay loam, 5 to 9 percent slopes, moderately eroded-----	1,385	0.5
592D2	Mystic clay loam, 9 to 14 percent slopes, moderately eroded-----	2,165	0.8
711	Nodaway-Lawson complex, 0 to 2 percent slopes-----	3,125	1.1
792C	Armstrong loam, 5 to 9 percent slopes-----	400	0.1
792C2	Armstrong clay loam, 5 to 9 percent slopes, moderately eroded-----	2,630	0.9
792D	Armstrong loam, 9 to 14 percent slopes-----	1,575	0.6
792D2	Armstrong clay loam, 9 to 14 percent slopes, moderately eroded-----	18,500	6.6
792D3	Armstrong clay loam, 9 to 14 percent slopes, severely eroded-----	215	*
822C	Lamoni silty clay loam, 5 to 9 percent slopes-----	420	0.2
822C2	Lamoni silty clay loam, 5 to 9 percent slopes, moderately eroded-----	4,605	1.7
822D	Lamoni silty clay loam, 9 to 14 percent slopes-----	200	*
822D2	Lamoni silty clay loam, 9 to 14 percent slopes, moderately eroded-----	3,905	1.4
831B	Pershing silt loam, bench, 2 to 5 percent slopes-----	825	0.3
831C	Pershing silt loam, bench, 5 to 9 percent slopes-----	855	0.3
831C2	Pershing silty clay loam, bench, 5 to 9 percent slopes, moderately eroded-----	1,205	0.4
894D2	Bucknell-Gara complex, 9 to 14 percent slopes, moderately eroded-----	395	0.1
993D2	Gara-Armstrong complex, 9 to 14 percent slopes, moderately eroded-----	2,140	0.8
1711	Nodaway-Lawson complex, channeled, 0 to 2 percent slopes-----	3,260	1.2
5021	Orthents, hilly-----	100	*
5025	Strip mines, dumps-----	120	*
5040	Orthents, loamy-----	165	*
	Total-----	278,300	100.0

\* Less than 0.1 percent.

## Soil Series and Detailed Soil Map Units

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In this section, arranged in alphabetical order, each soil series recognized in the survey area is described. Each description is followed by the detailed soil map units associated with the series.

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1975). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units on the detailed soil maps represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given in Part II of this survey.

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management.

These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit descriptions. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit. The principal hazards and limitations to be considered in planning for specific uses are described in Part II of this survey.

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

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that

affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Arispe silty clay loam, 5 to 9 percent slopes, is a phase of the Arispe series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called soil complexes.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Zook-Olmitz-Vesser complex, 0 to 5 percent slopes, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Strip mines, dumps, is an example.

The table "Acreage and Proportionate Extent of the Soils" in Parts I and II of this survey gives the acreage and proportionate extent of each map unit. Other tables (see Contents) give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

## Ackmore Series

*Drainage class:* Somewhat poorly drained

*Permeability:* Moderate

*Landform:* Flood plains

*Parent material:* Silty alluvium

*Native vegetation:* Prairie grasses

*Slope range:* 0 to 2 percent

### Typical Pedon

Ackmore silt loam, 0 to 2 percent slopes, in a cultivated field, 495 feet north and 330 feet west of the southeast corner of sec. 29, T. 72 N., R. 23 W.; U.S.G.S. Lucas, Iowa, topographic quadrangle; lat. 94 degrees, 34 minutes, and 21 seconds N. and long. 45 degrees, 42 minutes, and 10 seconds W.

Ap—0 to 8 inches; silt loam, 80 percent very dark grayish brown (10YR 3/2) and 20 percent dark grayish brown (10YR 4/2); cloddy parting to moderate fine granular structure; friable; common medium and many very fine and fine roots; slightly acid; clear smooth boundary.

C1—8 to 18 inches; stratified dark grayish brown

(10YR 4/2), grayish brown (10YR 5/2), and very dark grayish brown (10YR 3/2) silt loam; few fine distinct yellowish brown (10YR 5/4) mottles; massive; friable; few medium and many very fine and fine roots; slightly acid; abrupt smooth boundary.

C2—18 to 28 inches; stratified very dark grayish brown (10YR 3/2) and grayish brown (10YR 5/2) silt loam, white (10YR 8/2) dry; massive; friable; few medium and many very fine and fine roots; moderately acid; abrupt smooth boundary.

2Ab1—28 to 36 inches; black (10YR 2/1) silty clay loam; moderate fine prismatic structure parting to moderate very fine and fine granular; friable; common very fine and fine roots; moderately acid; clear smooth boundary.

2Ab2—36 to 45 inches; black (N 2/0) silty clay loam; moderate very fine and fine subangular blocky structure parting to moderate fine granular; friable; few very fine and fine roots; slightly acid; gradual smooth boundary.

2Ab3—45 to 55 inches; black (N 2/0) silty clay; moderate fine prismatic structure parting to moderate very fine and fine subangular blocky; firm; few very fine and fine roots; few faint pressure faces on faces of peds and in pores; slightly acid; gradual smooth boundary.

2Ab4—55 to 62 inches; black (N 2/0 and 10YR 2/1) silty clay loam; moderate fine prismatic structure parting to moderate very fine and fine subangular blocky; firm; few very fine and fine roots; slightly acid.

### Range in Characteristics

*Thickness of the A and C horizons:* 20 to 36 inches

*A horizon:*

Hue—10YR

Value—3 or 4

Chroma—1 or 2

Texture—silt loam

*C horizon:*

Hue—10YR

Value—3 to 5

Chroma—1 or 2

Texture—silt loam

*2Ab horizon:*

Hue—10YR, 2.5Y, or neutral

Value—2

Chroma—0 or 1

Texture—silty clay loam or silt loam



### 430—Ackmore silt loam, 0 to 2 percent slopes

#### **Composition**

Ackmore and similar soils: About 90 percent  
Inclusions: About 10 percent

#### **Setting**

*Landform:* Flood plains  
*Slope:* 0 to 2 percent

#### **Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Somewhat poorly drained  
*Dominant parent material:* Silty alluvium  
*Frequency of flooding:* Occasional  
*Depth to the water table:* 1 to 3 feet  
*Kind of water table:* Apparent  
*Available water capacity to 60 inches or root-limiting layer:* About 12.2 inches (high)  
*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### **Inclusions**

- Poorly drained areas
- Nodaway and similar soils

#### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

#### **Adair Series**

*Drainage class:* Moderately well drained  
*Permeability:* Slow  
*Landform:* Uplands  
*Parent material:* Red paleosol weathered from glacial till  
*Native vegetation:* Prairie grasses

*Slope range:* 5 to 14 percent

#### **Typical Pedon**

Adair clay loam, 5 to 9 percent slopes, moderately eroded, 220 feet east and 1,620 feet north of the southwest corner of sec. 4, T. 71 N., R. 20 W.

- Ap—0 to 6 inches; clay loam, 80 percent very dark grayish brown (10YR 3/2) and 20 percent brown or dark brown (10YR 4/3); dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; friable; common medium and many very fine and fine roots; few very dark gray (10YR 3/1) organic coatings; slightly acid; clear smooth boundary.
- Bt1—6 to 10 inches; brown or dark brown (7.5YR 4/4) clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate very fine and fine subangular blocky structure; firm; few medium and many very fine and fine roots; few very dark grayish brown (10YR 3/2) organic coatings in root channels, in pores, or both; few distinct brown or dark brown (10YR 4/3) and very dark gray (10YR 3/1) clay films (cutans) on faces of pedis; few fine rounded iron-manganese concretions; moderately acid; 10 percent pebbles (mixed); clear smooth boundary.
- 2Bt2—10 to 16 inches; brown or dark brown (7.5YR 4/4) clay; many fine distinct strong brown (7.5YR 5/6) mottles; moderate very fine and fine subangular blocky structure; very firm; few medium and many very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct brown or dark brown (7.5YR 4/2) and dark gray (10YR 4/1) clay films (cutans) on faces of pedis; very few light gray (10YR 7/2) discontinuous coatings; common fine rounded iron-manganese concretions; moderately acid; 10 percent pebbles (mixed); clear smooth boundary.
- 2Bt3—16 to 25 inches; yellowish red (5YR 5/6) clay; common fine distinct reddish brown (5YR 4/4) and yellowish red (5YR 4/6) mottles; moderate fine and medium prismatic structure parting to moderate fine subangular blocky; very firm; few medium and many very fine and fine roots; few dark gray (10YR 4/1) organic coatings in root channels, pores, or both; few distinct brown or dark brown (7.5YR 4/2) clay films (cutans) on faces of pedis; common fine rounded iron-manganese concretions; moderately acid; 10 percent pebbles (mixed); gradual smooth boundary.
- 2Bt4—25 to 29 inches; strong brown (7.5YR 5/6) clay; common fine distinct yellowish red (5YR 4/6)

and 5/8) mottles; moderate medium prismatic structure; very firm; few medium and common very fine and fine roots; few dark gray (10YR 4/1) organic coatings in root channels, pores, or both; few distinct dark grayish brown (10YR 4/2 and 4/4) clay films (cutans) on faces of peds; many fine and medium rounded iron-manganese concretions; neutral; 10 percent pebbles (mixed); gradual smooth boundary.

**2Bt5**—29 to 45 inches; strong brown (7.5YR 5/6) clay loam; common fine distinct yellowish red (5YR 4/6 and 5/8) and grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few medium and common very fine and fine roots; few distinct brown (10YR 5/3) or dark brown (10YR 4/3) clay films (cutans) on faces of peds; common fine and medium rounded iron-manganese concretions; neutral; 10 percent pebbles (mixed); gradual smooth boundary.

**2BC**—45 to 60 inches; clay loam, 50 percent yellowish brown (10YR 5/4) and 50 percent yellowish brown (10YR 5/6); many fine and medium distinct strong brown (7.5YR 4/6 and 5/8) and grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to weak fine and medium subangular blocky; firm; few very fine and fine roots; few faint brown (10YR 5/3) or dark brown (10YR 4/3) clay films (cutans) on faces of peds; common fine and medium rounded iron-manganese concretions; neutral.

#### Range in Characteristics

*Thickness of the solum:* 48 to more than 60 inches

*Thickness of the mollic epipedon:* 6 to 10 inches

*Depth to carbonates:* 48 to more than 60 inches

#### *A horizon:*

Hue—10YR or 7.5YR

Value—2 or 3

Chroma—1 or 2

Texture—clay loam or loam

#### *Bt horizon:*

Hue—10YR or 7.5YR

Value—4 or 5

Chroma—4 to 6

Texture—clay loam or loam

#### *BC or C horizon:*

Hue—2.5YR to 10YR

Value—3 to 5

Chroma—4 to 6

Texture—clay or clay loam

## 192C2—Adair clay loam, 5 to 9 percent slopes, moderately eroded

### Composition

Adair and similar soils: About 95 percent

Inclusions: About 5 percent

### Setting

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 5 to 9 percent

### Component Description

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Reddish paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.1 inches (high)

*Organic matter content of the surface layer:* About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### Inclusions

- Lamoni and similar soils

### Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

## 192D2—Adair clay loam, 9 to 14 percent slopes, moderately eroded

### Composition

Adair and similar soils: About 95 percent

Inclusions: About 5 percent

### Setting

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

### Component Description

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Reddish paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.1 inches (high)

*Organic matter content of the surface layer:* About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### Inclusions

- Lamoni and similar soils

### Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### Arispe Series

*Drainage class:* Somewhat poorly drained

*Permeability:* Slow

*Landform:* Uplands

*Parent material:* Loess over a gray paleosol weathered from glacial till

*Native vegetation:* Prairie grasses

*Slope range:* 5 to 9 percent

### Typical Pedon

Arispe silty clay loam, 5 to 9 percent slopes, 725 feet

south and 2,310 feet east of the northwest corner of sec. 8, T. 71 N., R. 22 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1), black (10YR 2/1), and very dark grayish brown (10YR 3/2) silty clay loam; moderate very fine and fine granular structure; friable; common medium and many very fine and fine roots; slightly acid; clear smooth boundary.

Bt1—10 to 16 inches; dark grayish brown (10YR 4/2), brown or dark brown (10YR 4/3) exterior silty clay loam; common fine distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) mottles; moderate very fine and fine subangular blocky structure; firm; common medium and many very fine and fine roots; common distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) clay films on faces of peds and in pores; moderately acid; gradual smooth boundary.

Bt2—16 to 22 inches; dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silty clay; common fine prominent yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few medium roots, many very fine and fine roots, and few coarse roots; common distinct dark grayish brown (10YR 4/2) and dark gray (10YR 4/1) clay films on faces of peds and in pores; slightly acid; gradual smooth boundary.

Bt3—22 to 27 inches; grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2) silty clay loam; common fine prominent dark yellowish brown (10YR 4/6), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few medium and many very fine and fine roots; common distinct dark grayish brown (10YR 4/2) and 2.5Y 4/2 clay films on faces of peds and in pores; slightly acid; gradual smooth boundary.

Bt4—27 to 33 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine prominent strong brown (7.5YR 4/6 and 5/8) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; firm; common very fine and fine roots; common distinct dark grayish brown (2.5Y 4/2) clay films on faces of peds and in pores; neutral; gradual smooth boundary.

Bt5—33 to 43 inches; light brownish gray (2.5Y 6/2) silty clay loam; many fine and medium prominent strong brown (7.5YR 5/6 and 5/8) mottles; weak medium prismatic structure; friable; common

very fine and fine roots; common distinct grayish brown (2.5Y 5/2) clay films on faces of peds and in pores; neutral; gradual smooth boundary.

BC—43 to 56 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine prominent strong brown (7.5YR 4/6 and 5/8) mottles; massive; friable; few very fine and fine roots; very few faint grayish brown (2.5Y 5/2) clay films on faces of peds and in pores; neutral; abrupt smooth boundary.

2Bb—56 to 60 inches; dark gray (10YR 4/1) clay; common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; very firm; neutral.

#### **Range in Characteristics**

*Thickness of the solum:* 36 to 60 inches

*Thickness of the mollic epipedon:* 6 to 14 inches

*Depth to carbonates:* More than 60 inches

#### *A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silty clay loam

#### *Bt horizon:*

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—2 or 3

Texture—silty clay or silty clay loam

#### *BC horizon:*

Hue—2.5Y or 5Y

Value—4 to 6

Chroma—1 or 2

Texture—silty clay loam

### **23C—Arispe silty clay loam, 5 to 9 percent slopes**

#### **Composition**

Arispe and similar soils: 100 percent

#### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, side slopes, and interfluves

*Hillslope position:* Summits, shoulders, and backslopes

*Slope:* 5 to 9 percent

#### **Component Description**

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Loess over a gray paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 2 to 4 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 11.7 inches (high)

*Organic matter content of the surface layer:* About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **23C2—Arispe silty clay loam, 5 to 9 percent slopes, moderately eroded**

#### **Composition**

Arispe and similar soils: 100 percent

#### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, side slopes, and interfluves

*Hillslope position:* Summits, shoulders, and backslopes

*Slope:* 5 to 9 percent

#### **Component Description**

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Loess over a gray paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 2 to 4 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 11.6 inches (high)

*Organic matter content of the surface layer:* About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **Armstrong Series**

*Drainage class:* Moderately well drained

*Permeability:* Slow

*Landform:* Uplands

*Parent material:* Reddish paleosol weathered from glacial till

*Native vegetation:* Mixed prairie grasses and deciduous trees

*Slope range:* 5 to 14 percent

#### **Typical Pedon**

Armstrong loam, 9 to 14 percent slopes, 330 feet north and 725 feet west of the southeast corner of sec. 21, T. 72 N., R. 22 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) loam; moderate very fine and fine granular structure; friable; common medium and many very fine and fine roots; neutral; clear smooth boundary.

E—7 to 11 inches; grayish brown (10YR 5/2) loam; common fine distinct yellowish brown (10YR 5/4) mottles; moderate thin platy structure; friable; common medium and many very fine and fine roots; common very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; clear smooth boundary.

BE—11 to 14 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak very fine and fine subangular blocky structure; friable; common medium and many very fine and fine roots; common dark grayish brown (10YR 4/2) and very dark gray (10YR 3/1) organic coatings on faces of peds; very strongly acid; 3 percent pebbles; clear smooth boundary.

Bt1—14 to 17 inches; dark yellowish brown (10YR 4/4) clay loam; common fine distinct yellowish

red (5YR 4/6 and 5/8) mottles; moderate very fine and fine subangular blocky structure; firm; few medium and many very fine and fine roots; common very dark gray (10YR 3/1) organic coatings on faces of peds and common distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; very strongly acid; 10 percent pebbles; clear smooth boundary.

2Bt2—17 to 25 inches; strong brown (7.5YR 5/6) clay; many medium prominent reddish brown (5YR 4/4), distinct yellowish red (5YR 4/6), and prominent yellowish red (5YR 5/8) and common fine dark reddish brown (2.5YR 3/4) and reddish brown (2.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; few medium and many very fine and fine roots; common very dark gray (10YR 3/1) organic coatings on faces of peds and common distinct dark brown or brown (7.5YR 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; very strongly acid; 30 percent pebbles; gradual smooth boundary.

2Bt3—25 to 32 inches; strong brown (7.5YR 5/8 and 5/6) clay; common fine distinct yellowish red (5YR 4/6) and red (2.5YR 4/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; few medium and many very fine and fine roots; common very dark gray (10YR 3/1) and dark gray (10YR 4/1) organic coatings and common distinct dark brown or brown (7.5YR 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; very strongly acid; 3 percent pebbles; gradual smooth boundary.

2Bt4—32 to 40 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct strong brown (7.5YR 4/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common very fine and fine roots; common distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine and medium rounded iron-manganese concretions; slightly acid; 30 percent pebbles; gradual smooth boundary.

2Bt5—40 to 45 inches; yellowish brown (10YR 5/4 and 5/6) clay loam; common fine distinct light brownish gray (2.5Y 6/2), strong brown (7.5YR 4/6), and brown or dark brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine and fine roots;

common distinct grayish brown (10YR 5/2) clay films (cutans) on faces of pedes; common fine and medium rounded iron-manganese concretions; neutral; 30 percent pebbles; gradual smooth boundary.

**2Bt6**—45 to 54 inches; yellowish brown (10YR 5/6) clay loam; common fine and medium prominent light brownish gray (2.5Y 6/2) and brown or dark brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few very fine and fine roots; common distinct grayish brown (10YR 5/2) clay films (cutans) on faces of pedes; common fine and medium rounded iron-manganese concretions; neutral; 30 percent pebbles; gradual smooth boundary.

**2Bt7**—54 to 60 inches; light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6) clay loam; common fine and medium distinct strong brown (7.5YR 4/6) and brown or dark brown (7.5YR 4/4) mottles; moderate medium prismatic structure; firm; common distinct grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) clay films (cutans) on faces of pedes; common fine and medium rounded iron-manganese concretions; neutral; 30 percent pebbles.

#### Range in Characteristics

*Thickness of the solum:* 42 to more than 60 inches

*Thickness of the mollic epipedon:* 6 to 10 inches

*Depth to carbonates:* 42 or more inches

#### A horizon:

Hue—10YR

Value—3

Chroma—1 or 2

Texture—loam or clay loam

#### E horizon:

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—loam or silt loam

#### Bt horizon:

Hue—10YR

Value—4 or 5

Chroma—2 to 8

Texture—clay loam

#### 2Bt horizon:

Hue—10YR or 7.5YR

Value—4 to 6

Chroma—2 to 6

Texture—clay or clay loam

## 792C—Armstrong loam, 5 to 9 percent slopes

### Composition

Armstrong and similar soils: 100 percent

### Setting

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 5 to 9 percent

### Component Description

*Surface layer texture:* Loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Reddish paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.2 inches (high)

*Organic matter content of the surface layer:* About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## 792C2—Armstrong clay loam, 5 to 9 percent slopes, moderately eroded

### Composition

Armstrong and similar soils: 100 percent

### Setting

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 5 to 9 percent

### **Component Description**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Reddish paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 8.8 inches (moderate)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## **792D—Armstrong loam, 9 to 14 percent slopes**

### **Composition**

Armstrong and similar soils: 100 percent

### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

### **Component Description**

*Surface layer texture:* Loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Reddish paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.2 inches (high)

*Organic matter content of the surface layer:* About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## **792D2—Armstrong clay loam, 9 to 14 percent slopes, moderately eroded**

### **Composition**

Armstrong and similar soils: 100 percent

### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

### **Component Description**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Reddish paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 8.8 inches (moderate)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## **792D3—Armstrong clay loam, 9 to 14 percent slopes, severely eroded**

### **Composition**

Armstrong and similar soils: 100 percent

### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

### **Component Description**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Reddish paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 8.8 inches (moderate)

*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Hayland

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## **Bucknell Series**

*Drainage class:* Somewhat poorly drained

*Permeability:* Slow

*Landform:* Uplands

*Parent material:* Gray paleosol weathered from glacial till

*Native vegetation:* Mixed prairie grasses and deciduous trees

*Slope range:* 5 to 14 percent

### **Typical Pedon**

Bucknell silty clay loam, 5 to 9 percent slopes, moderately eroded, 2,410 feet south and 1,980 feet west of the northeast corner of sec. 29, T. 73 N., R. 21 W.

Ap—0 to 7 inches; 60 percent very dark grayish brown (10YR 3/2), very dark gray (10YR 3/1) exterior, 20 percent dark grayish brown (10YR 4/2), and 20 percent brown or dark brown (10YR 4/3) silty clay loam; 60 percent dark gray (10YR 4/1) dry, 40 percent gray (10YR 5/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; many fine roots; neutral; clear smooth boundary.

BE—7 to 11 inches; dark grayish brown (10YR 4/2) clay; common fine distinct dark yellowish brown (10YR 4/4) and few prominent brown or dark brown (7.5YR 4/4) mottles; moderate fine and medium subangular blocky structure; friable; common fine roots; few very dark grayish brown (10YR 3/2) organic coatings in root channels, pores, or both; few faint dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; neutral; clear smooth boundary.

Bt1—11 to 20 inches; brown (10YR 5/3) clay; common fine prominent brown or dark brown (7.5YR 4/4) and distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak fine subangular blocky; firm; common very fine and fine roots; few dark grayish brown (10YR 4/2) organic coatings in root channels, pores, or both; few distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine and medium irregular



iron-manganese concretions; neutral; gradual smooth boundary.

**Bt2**—20 to 29 inches; brown (10YR 5/3) clay; few fine prominent strong brown (7.5YR 4/6) and common distinct yellowish brown (10YR 5/6) mottles; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky; very firm; common very fine and fine roots; few distinct grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; few fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

**Bt3**—29 to 36 inches; clay loam, 60 percent grayish brown (10YR 5/2) and 40 percent yellowish brown (10YR 5/6); common fine distinct gray (10YR 5/1) and prominent strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; few faint grayish brown (10YR 5/2) clay films (cutans) on faces of peds; few fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

**Bt4**—36 to 49 inches; clay loam, 50 percent yellowish brown (10YR 5/6) and 50 percent gray (10YR 5/1); common fine prominent strong brown (7.5YR 4/6) mottles; moderate medium and coarse prismatic structure; very firm; few faint gray (10YR 5/1) and grayish brown (2.5Y 5/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

**BC**—49 to 60 inches; yellowish brown (10YR 5/6) clay loam; many medium prominent light gray or gray (5Y 6/1) mottles; moderate medium and coarse prismatic structure; very firm; few fine rounded iron-manganese concretions; neutral.

#### **Range in Characteristics**

*Thickness of the solum:* 48 to 60 inches

*Depth to carbonates:* More than 60 inches

*A horizon:*

Hue—10YR  
Value—2 or 3  
Chroma—1 or 2  
Texture—silty clay loam

*E horizon (if it occurs):*

Hue—10YR  
Value—4 or 5  
Chroma—2 or 3  
Texture—silt loam

*Bt horizon:*

Hue—10YR to 2.5Y  
Value—4 to 6

Chroma—2 to 6  
Texture—clay or clay loam

*BC or C horizon:*

Hue—10YR or 2.5Y  
Value—4 to 6  
Chroma—1 to 6  
Texture—clay loam

### **423C2—Bucknell silty clay loam, 5 to 9 percent slopes, moderately eroded**

#### **Composition**

Bucknell and similar soils: About 95 percent  
Inclusions: About 5 percent

#### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Summits, shoulders, and backslopes

*Slope:* 5 to 9 percent

#### **Component Description**

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Gray paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.4 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

#### **Inclusions**

- Rinda and similar soils
- Severely eroded areas

#### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **423D—Bucknell silty clay loam, 9 to 14 percent slopes**

#### ***Composition***

Bucknell and similar soils: About 95 percent  
Inclusions: About 5 percent

#### ***Setting***

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 9 to 14 percent

#### ***Component Description***

*Surface layer texture:* Silty clay loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Somewhat poorly drained  
*Dominant parent material:* Gray paleosol weathered from glacial till  
*Flooding:* None  
*Depth to the water table:* 1 to 3 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 9.6 inches (high)  
*Organic matter content of the surface layer:* About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### ***Inclusions***

- Rinda and similar soils

#### ***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **423D2—Bucknell silty clay loam, 9 to 14 percent slopes, moderately eroded**

#### ***Composition***

Bucknell and similar soils: About 95 percent  
Inclusions: About 5 percent

#### ***Setting***

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 9 to 14 percent

#### ***Component Description***

*Surface layer texture:* Silty clay loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Somewhat poorly drained  
*Dominant parent material:* Gray paleosol weathered from glacial till  
*Flooding:* None  
*Depth to the water table:* 1 to 3 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 9.4 inches (high)  
*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### ***Inclusions***

- Rinda and similar soils
- Severely eroded areas

#### ***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## 894D2—Bucknell-Gara complex, 9 to 14 percent slopes, moderately eroded

### *Composition*

Bucknell and similar soils: About 65 percent

Gara and similar soils: About 35 percent

### *Setting*

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

### *Component Description*

#### **Bucknell**

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.4 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

#### **Gara**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### *Major Uses of the Unit*

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **Caleb Series**

*Drainage class:* Moderately well drained

*Permeability:* Moderate

*Landform:* Stream terraces

*Parent material:* Old valley alluvium

*Native vegetation:* Mixed prairie grasses and deciduous trees

*Slope range:* 9 to 18 percent

### **Typical Pedon**

Caleb loam, 9 to 14 percent slopes, moderately eroded, 130 feet north and 925 feet west of the southeast corner of sec. 21, T. 72 N., R. 23 W.

Ap—0 to 7 inches; loam, 70 percent very dark grayish brown (10YR 3/2) and 30 percent brown or dark brown (10YR 4/3); grayish brown (10YR 5/2) dry; weak very fine and fine subangular blocky structure parting to weak very fine and fine granular; friable; few medium and many very fine and fine roots; slightly acid; clear smooth boundary.

Bt1—7 to 12 inches; clay loam, 50 percent brown or dark brown (10YR 4/3) and 50 percent dark yellowish brown (10YR 4/4); few fine faint dark yellowish brown (10YR 4/6) mottles; moderate fine and medium subangular blocky structure parting to moderate very fine and fine subangular blocky; friable; few medium and many very fine and fine roots; few dark brown (10YR 3/3) organic coatings, few distinct dark yellowish brown (10YR 4/4) clay films (cutans) on faces of peds, and few very pale brown (10YR 7/3) coatings; few fine rounded iron-manganese concretions; slightly acid; clear smooth boundary.

Bt2—12 to 19 inches; clay loam, 50 percent dark yellowish brown (10YR 4/4) and 50 percent brown or dark brown (10YR 4/3); common fine distinct yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/6) mottles; moderate very fine and fine subangular blocky structure; friable; few medium and many very fine and fine roots; few distinct brown or dark brown (10YR 4/3) clay films (cutans) on faces of peds and few very pale brown (10YR 7/3) coatings; few fine rounded iron-manganese concretions; moderately acid; clear smooth boundary.

**Bt3**—19 to 26 inches; yellowish brown (10YR 5/4) clay loam; moderate fine prismatic structure parting to moderate fine and medium subangular blocky; friable; common very fine and fine roots; few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds, few dark yellowish brown (10YR 4/4) clay films (cutans), and few very pale brown (10YR 7/3) coatings; common fine rounded iron-manganese concretions; strongly acid; gradual smooth boundary.

**Bt4**—26 to 35 inches; yellowish brown (10YR 5/4) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; common very fine and fine roots; very few prominent dark brown (7.5YR 3/4) clay films (cutans) on faces of peds and few distinct brown (10YR 5/3) coatings; common fine rounded iron-manganese concretions; strongly acid; gradual smooth boundary.

**BC**—35 to 43 inches; brown (10YR 5/3) clay loam; common fine prominent strong brown (7.5YR 5/8 and 4/6) mottles; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; friable; few very fine and fine roots; few distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds and few pale brown (10YR 6/3) coatings; common fine rounded iron-manganese concretions; strongly acid; gradual smooth boundary.

**C**—43 to 60 inches; brown (10YR 5/3), strong brown (7.5YR 5/8 and 4/6), and grayish brown (10YR 5/2) clay loam; massive; friable; very strongly acid.

#### **Range in Characteristics**

*Thickness of the solum:* 42 to 60 inches

*Depth to carbonates:* Greater than 60 inches

#### *A horizon:*

Hue—10YR

Value—3

Chroma—1 or 2

Texture—loam or clay loam

#### *E horizon (if it occurs):*

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—silt loam or loam

#### *Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 to 6

Texture—clay loam or loam

#### *BC or C horizon:*

Hue—10YR

Value—4 or 5

Chroma—2 to 8

Texture—clay loam to silty clay loam

### **451D2—Caleb loam, 9 to 14 percent slopes, moderately eroded**

#### ***Composition***

Caleb and similar soils: About 90 percent

Inclusions: About 10 percent

#### ***Setting***

*Landform:* Stream terraces

*Geomorphic component:* Side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

#### ***Component Description***

*Surface layer texture:* Loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Old valley alluvium

*Flooding:* None

*Depth to the water table:* 3 to 5 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.3 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### ***Inclusions***

- Soils that have a thinner surface layer than the Caleb soil
- Somewhat poorly drained soils
- Severely eroded areas

#### ***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

- Forest Land section

## 451E2—Caleb loam, 14 to 18 percent slopes, moderately eroded

### Composition

Caleb and similar soils: About 90 percent  
Inclusions: About 10 percent

### Setting

*Landform:* Stream terraces  
*Geomorphic component:* Side slopes  
*Hillslope position:* Backslopes  
*Slope:* 14 to 18 percent

### Component Description

*Surface layer texture:* Loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Old valley alluvium  
*Flooding:* None  
*Depth to the water table:* 3 to 5 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 9.3 inches (high)  
*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### Inclusions

- Soils that have a thinner surface layer than the Caleb soil
- Soils that have more clay than the Caleb soil
- Severely eroded areas

### Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## Chequest Series

*Drainage class:* Poorly drained  
*Permeability:* Moderately slow  
*Landform:* Flood plains  
*Parent material:* Silty alluvium  
*Native vegetation:* Mixed prairie grasses and trees  
*Slope range:* 0 to 2 percent

### Typical Pedon

Chequest silty clay loam, 0 to 2 percent slopes, 455 feet south and 660 feet west of the northeast corner of sec. 18, T. 71 N., R. 22 W.

- Ap—0 to 7 inches; black (10YR 2/1) silty clay loam; moderate very fine and fine granular structure; friable; common medium and many very fine and fine roots; moderately acid; clear smooth boundary.
- A—7 to 12 inches; black (10YR 2/1) silty clay loam; moderate very fine and fine angular blocky structure parting to moderate fine granular; friable; common medium and many very fine and fine roots; moderately acid; clear smooth boundary.
- Btg1—12 to 18 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent strong brown (7.5YR 4/6) and dark brown (7.5YR 3/2) mottles; moderate very fine and fine subangular blocky structure; firm; common medium and many very fine and fine roots; many very dark gray (10YR 3/1) clay films on faces of peds and common pale brown (10YR 6/3 dry) coatings of silt and very fine sand; common fine rounded iron-manganese concretions; moderately acid; gradual smooth boundary.
- Btg2—18 to 24 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent strong brown (7.5YR 4/6) and few dark reddish brown (5YR 3/3) mottles; moderate fine subangular blocky structure; firm; common medium and many very fine and fine roots; many very dark gray (10YR 3/1) clay films on faces of peds and common light gray (10YR 7/2 dry) coatings of silt and very fine sand; common fine rounded iron-manganese concretions; moderately acid; gradual smooth boundary.
- Btg3—24 to 31 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few medium and many very fine and fine roots; many very dark gray (10YR 3/1) clay films on faces of peds and

common gray or light gray (10YR 6/1 dry) coatings of silt and very fine sand; common fine rounded iron-manganese concretions; moderately acid; gradual smooth boundary.

**Btg4**—31 to 39 inches; very dark gray (10YR 3/1) and dark gray (10YR 4/1) silty clay loam; common fine distinct brown (7.5YR 4/2) or dark brown (7.5YR 3/2) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few medium and many very fine and fine roots; many black (10YR 2/1) clay films on faces of peds and common gray or light gray (10YR 6/1 dry) coatings of silt and very fine sand; common fine rounded iron-manganese concretions; moderately acid; gradual smooth boundary.

**Btg5**—39 to 46 inches; dark gray (10YR 4/1) and very dark gray (10YR 3/1) silty clay loam; common fine distinct brown (7.5YR 4/2) or dark brown (7.5YR 3/2) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; firm; few medium and many very fine and fine roots; common black (10YR 2/1) clay films on faces of peds and common gray or light gray (10YR 6/1 dry) coatings of silt and very fine sand; common fine rounded iron-manganese concretions; moderately acid; gradual smooth boundary.

**Btg6**—46 to 60 inches; gray (10YR 5/1) and dark gray (10YR 4/1) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; firm; common very fine and fine roots; common faint black (10YR 2/1) clay films on faces of peds; common fine rounded iron-manganese concretions; neutral.

#### Range in Characteristics

*Thickness of the solum:* 42 to 65 inches

*Thickness of the mollic epipedon:* 10 to 15 inches

*Depth to carbonates:* Greater than 60 inches

#### A horizon:

Hue—10YR

Value—2 or 3

Chroma—1

Texture—silty clay loam or silt loam

#### Btg horizon:

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—1 or 2

Texture—silty clay loam or silt loam

## 587—Chequest silty clay loam, 0 to 2 percent slopes

### Composition

Chequest and similar soils: About 90 percent

Inclusions: About 10 percent

### Setting

*Landform:* Flood plains

*Slope:* 0 to 2 percent

### Component Description

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Poorly drained

*Dominant parent material:* Silty alluvium

*Frequency of flooding:* Occasional

*Water table:* At the surface to 1 foot below the surface

*Kind of water table:* Apparent

*Available water capacity to 60 inches or root-limiting layer:* About 10.0 inches (high)

*Organic matter content of the surface layer:* About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### Inclusions

- Zook and similar soils

### Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## 587+—Chequest silt loam, 0 to 2 percent slopes, overwash

### Composition

Chequest and similar soils: About 90 percent

Inclusions: About 10 percent

### Setting

*Landform:* Flood plains

*Slope:* 0 to 2 percent

### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Poorly drained

*Dominant parent material:* Silty alluvium

*Frequency of flooding:* Occasional

*Water table:* At the surface to 1 foot below the surface

*Kind of water table:* Apparent

*Available water capacity to 60 inches or root-limiting layer:* About 10.4 inches (high)

*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### Inclusions

- Soils that have a higher content of clay

### Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### Clarinda Series

*Drainage class:* Poorly drained

*Permeability:* Very slow

*Landform:* Uplands

*Parent material:* Gray paleosol weathered from glacial till

*Native vegetation:* Prairie grasses

*Slope range:* 5 to 14 percent

### Typical Pedon

Clarinda silty clay loam, 5 to 9 percent slopes, 2,245 feet south and 2,530 feet east of the northwest corner of sec. 13, T. 71 N., R. 20 W.

Ap—0 to 10 inches; silty clay loam, 50 percent very

dark gray (10YR 3/1) and 50 percent black (10YR 2/1); dark gray (10YR 4/1) dry; moderate very fine and fine granular structure; friable; many very fine and fine roots; neutral; clear smooth boundary.

AB—10 to 14 inches; 70 percent very dark grayish brown (10YR 3/2), 30 percent very dark gray (10YR 3/1) exterior silty clay loam; 70 percent grayish brown (2.5Y 5/2) dry and 30 percent gray (10YR 5/1) exterior dry; many fine faint dark grayish brown (10YR 4/2) mottles; weak fine subangular blocky structure parting to moderate very fine and fine granular; firm; few medium and many very fine and fine roots; slightly acid; clear smooth boundary.

Btg1—14 to 19 inches; dark gray (10YR 4/1) silty clay; common fine distinct brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6) mottles; moderate fine and medium subangular blocky structure; very firm; few medium and many very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Btg2—19 to 24 inches; grayish brown (2.5Y 5/2) silty clay; common fine prominent brown or dark brown (7.5YR 4/4), strong brown (7.5YR 4/6), and yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; few medium and common very fine and fine roots; few very dark gray (10YR 3/1) organic coatings on faces of peds and in pores; common distinct dark grayish brown (2.5Y 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

Btg3—24 to 35 inches; gray (5Y 5/1) silty clay; common fine distinct dark yellowish brown (10YR 4/4 and 4/6) and yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; few medium and common very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct dark gray (10YR 4/1) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

Btg4—35 to 45 inches; gray (5Y 5/1) silty clay; many fine prominent dark yellowish brown (10YR 4/6)

and yellowish brown (10YR 5/8) and few strong brown (7.5YR 5/6) and brown or dark brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; few very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct gray (10YR 5/1) and dark gray (10YR 4/1) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

**Btg5**—45 to 60 inches; light gray or gray (5Y 6/1) silty clay; many fine distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/8) and prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; few very fine and fine roots; few distinct gray (5Y 5/1) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral.

#### **Range in Characteristics**

*Thickness of the solum:* Greater than 60 inches

*Thickness of the mollic epipedon:* 6 to 14 inches

*Depth to carbonates:* Greater than 60 inches

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1

Texture—silty clay loam

*Btg horizon:*

Hue—10YR to 5Y

Value—4 or 5

Chroma—1 or 2

Texture—silty clay or clay

### **222C—Clarinda silty clay loam, 5 to 9 percent slopes**

#### **Composition**

Clarinda and similar soils: 100 percent

#### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 5 to 9 percent

#### **Component Description**

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Poorly drained

*Dominant parent material:* Gray paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.4 inches (high)

*Organic matter content of the surface layer:* About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **222C2—Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded**

#### **Composition**

Clarinda and similar soils: 100 percent

#### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 5 to 9 percent

#### **Component Description**

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Poorly drained

*Dominant parent material:* Gray paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.2 inches (high)

*Organic matter content of the surface layer:* About 2.7 percent (moderate)



A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

#### ***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **222C3—Clarinda silty clay loam, 5 to 9 percent slopes, severely eroded**

#### ***Composition***

Clarinda and similar soils: 100 percent

#### ***Setting***

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 5 to 9 percent

#### ***Component Description***

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Poorly drained

*Dominant parent material:* Gray paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.2 inches (high)

*Organic matter content of the surface layer:* About 2.2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

#### ***Major Uses of the Unit***

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **222D2—Clarinda silty clay loam, 9 to 14 percent slopes, moderately eroded**

#### ***Composition***

Clarinda and similar soils: 100 percent

#### ***Setting***

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

#### ***Component Description***

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Poorly drained

*Dominant parent material:* Gray paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.2 inches (high)

*Organic matter content of the surface layer:* About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

#### ***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### ***Edina Series***

*Drainage class:* Poorly drained

*Permeability:* Very slow

*Landform:* Upland depressions

*Parent material:* Loess

*Native vegetation:* Prairie grasses

*Slope range:* 0 to 1 percent

### Typical Pedon

Edina silt loam, depressional, 0 to 1 percent slopes, 1,780 feet north and 2,045 feet west of the southeast corner of sec. 14, T. 71 N., R. 22 W.

Ap—0 to 9 inches; silt loam, 50 percent very dark gray (10YR 3/1) and 50 percent very dark grayish brown (10YR 3/2); dark gray (10YR 5/1) dry; cloddy parting to moderate fine granular structure; friable; common medium and many very fine and fine roots; strongly acid; clear smooth boundary.

E—9 to 16 inches; silt loam, 60 percent dark gray (10YR 4/1) and 40 percent dark grayish brown (10YR 4/2); 60 percent light gray or gray (10YR 6/1) dry and 40 percent gray (10YR 5/1) dry; moderate medium platy structure; friable; common medium and many very fine and fine roots; few very dark grayish brown (10YR 3/2) organic coatings on faces of peds and few white (10YR 8/2) coatings; few fine rounded iron-manganese concretions; strongly acid; clear smooth boundary.

EB—16 to 19 inches; silty clay loam, 50 percent dark grayish brown (10YR 4/2) and 50 percent grayish brown (10YR 5/2); 50 percent grayish brown (10YR 5/2) dry and 50 percent light brownish gray (10YR 6/2) dry; common fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak thick platy structure parting to moderate very fine and fine subangular blocky; firm; common medium and many very fine and fine roots; few very dark gray (10YR 3/1) organic coatings, few faint dark gray (10YR 4/1) clay films (cutans) on faces of peds, and few light gray (10YR 7/2) coatings; common fine rounded iron-manganese concretions; moderately acid; clear smooth boundary.

Bt1—19 to 25 inches; very dark gray (10YR 3/1) silty clay; common fine prominent strong brown (7.5YR 4/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common medium and many very fine and fine roots; few prominent black (10YR 2/1) organic coatings; common fine rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Bt2—25 to 32 inches; silty clay, 50 percent dark grayish brown (2.5Y 4/2) and 50 percent light

olive brown (2.5Y 5/4); common fine prominent dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/8) and few strong brown (7.5YR 4/6) mottles; moderate fine and medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common medium, very fine, and fine roots; few prominent very dark gray (10YR 3/1) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Bt3—32 to 43 inches; silty clay, 50 percent grayish brown (2.5Y 5/2) and 50 percent light olive brown (2.5Y 5/4); common fine prominent dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; firm; common medium, very fine, and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct dark grayish brown (2.5Y 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

BCg—43 to 55 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/8) and prominent strong brown (7.5YR 4/6 and 5/8) mottles; weak medium and coarse prismatic structure; firm; few medium and common very fine and fine roots; very few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; very few distinct dark grayish brown (2.5Y 4/2) clay films (cutans) on faces of peds; common fine irregular iron-manganese concretions; neutral; gradual smooth boundary.

Cg—55 to 60 inches; silty clay loam, 70 percent light brownish gray (2.5Y 6/2) and 30 percent strong brown (7.5YR 5/6); massive; friable; few fine and medium roots; very few dark gray (10YR 4/1) organic coatings in root channels, pores, or both; very few faint grayish brown (2.5Y 5/2) clay films (cutans) on faces of peds; many fine rounded iron-manganese concretions; neutral.

### Range in Characteristics

*Thickness of the solum:* 40 to more than 60 inches

*Thickness of the mollic epipedon:* 10 to 18 inches

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1

Texture—silt loam

*E horizon:*

Hue—10YR or 2.5Y  
 Value—4 or 5  
 Chroma—1 or 2  
 Texture—silt loam

*Bt horizon:*

Hue—10YR or 2.5Y  
 Value—2 or 3  
 Chroma—1 or 2  
 Texture—silty clay or clay

*Cg horizon:*

Hue—7.5YR to 2.5Y  
 Value—4 to 6  
 Chroma—1 or 2  
 Texture—silty clay loam

## 211—Edina silt loam, depressional, 0 to 1 percent slopes

### Composition

Edina and similar soils: About 90 percent  
 Inclusions: About 10 percent

### Setting

*Landform:* Upland depressions  
*Geomorphic component:* Divides  
*Hillslope position:* Summits  
*Slope:* 0 to 1 percent

### Component Description

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Poorly drained  
*Dominant parent material:* Loess  
*Flooding:* None  
*Water table:* 0.5 foot above to 1.0 foot below the surface  
*Kind of water table:* Apparent  
*Available water capacity to 60 inches or root-limiting layer:* About 10.0 inches (high)  
*Organic matter content of the surface layer:* About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

### Inclusions

- Soils that have a thinner surface layer than the Edina soil

### Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### Gara Series

*Drainage class:* Well drained  
*Permeability:* Moderately slow  
*Landform:* Uplands  
*Parent material:* Glacial till  
*Native vegetation:* Mixed prairie grasses and deciduous trees  
*Slope range:* 9 to 40 percent

### Typical Pedon

Gara loam, 18 to 25 percent slopes, 2,005 feet north and 1,850 feet east of the southwest corner of sec. 27, T. 72 N., R. 21 W.

- Ap—0 to 7 inches; loam, very dark gray (10YR 3/1) and 20 percent dark yellowish brown (10YR 4/4); dark gray (10YR 4/1) dry; moderate very fine and fine granular structure; friable; common medium and many very fine and fine roots; moderately acid; clear smooth boundary.
- Bt1—7 to 12 inches; dark yellowish brown (10YR 4/4) clay loam; moderate very fine and fine subangular blocky structure parting to moderate very fine and fine angular blocky; friable; common fine and many very fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct brown or dark brown (10YR 4/3) clay films (cutans) on faces of peds and very few yellowish brown (10YR 5/6) oxide coatings; moderately acid; 2 percent pebbles (mixed); clear smooth boundary.
- Bt2—12 to 16 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct brown or dark brown (7.5YR 4/4) mottles; moderate very fine and fine subangular blocky structure; firm; few medium and many very fine and fine roots; few distinct dark yellowish brown (10YR 4/4) clay films (cutans) on faces of peds; few fine rounded iron-manganese concretions; moderately acid; 5 percent pebbles (mixed); gradual smooth boundary.
- Bt3—16 to 21 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic

structure parting to moderate fine subangular blocky; firm; few medium and many very fine and fine roots; few distinct brown or dark brown (10YR 4/3) clay films (cutans) on faces of peds and few brown or dark brown (7.5YR 4/4) oxide coatings; common fine rounded iron-manganese concretions; moderately acid; 4 percent pebbles (mixed); gradual smooth boundary.

**Bt4**—21 to 26 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct grayish brown (2.5Y 5/2) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few medium and common very fine and fine roots; few distinct dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) clay films (cutans) on faces of peds and few brown or dark brown (7.5YR 4/4) oxide coatings; common fine rounded iron-manganese concretions; slightly acid; 4 percent pebbles (mixed); gradual smooth boundary.

**Bt5**—26 to 33 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct grayish brown (2.5Y 5/2) and brown or dark brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few medium and common very fine and fine roots; few distinct grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly acid; 4 percent pebbles (mixed); gradual smooth boundary.

**Bt6**—33 to 47 inches; clay loam, 50 percent yellowish brown (10YR 5/6) and 50 percent grayish brown (2.5Y 5/2); common fine and medium distinct brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few medium and common very fine and fine roots; few distinct brown or dark brown (10YR 4/3) and dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; 3 percent pebbles (mixed); gradual smooth boundary.

**BC**—47 to 60 inches; clay loam, 50 percent yellowish brown (10YR 5/6) and 50 percent light gray or gray (10YR 6/1); common fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few very fine and fine roots; few faint dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4) clay films (cutans)

on faces of peds; common fine and medium irregular lime nodules; strongly effervescent; moderately alkaline; 3 percent pebbles (mixed).

### Range in Characteristics

*Thickness of the solum:* 40 to 60 inches  
*Depth to carbonates:* Greater than 30 inches

#### A horizon:

Hue—10YR  
Value—3  
Chroma—1 or 2  
Texture—loam or clay loam

#### E horizon (if it occurs):

Hue—10YR  
Value—3 or 4  
Chroma—2  
Texture—loam

#### Bt horizon:

Hue—10YR or 7.5YR  
Value—4 or 5  
Chroma—3 to 6  
Texture—clay loam

## 179D2—Gara clay loam, 9 to 14 percent slopes, moderately eroded

### Composition

Gara and similar soils: About 95 percent  
Inclusions: About 5 percent

### Setting

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

### Component Description

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this

map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

#### ***Inclusions***

- Armstrong and similar soils
- Severely eroded areas

#### ***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **179E—Gara loam, 14 to 18 percent slopes**

#### ***Composition***

Gara and similar soils: About 95 percent  
Inclusions: About 5 percent

#### ***Setting***

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 14 to 18 percent

#### ***Component Description***

*Surface layer texture:* Loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.6 inches (high)

*Organic matter content of the surface layer:* About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

#### ***Inclusions***

- Armstrong and similar soils

- Rinda and similar soils

#### ***Major Uses of the Unit***

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **179E2—Gara clay loam, 14 to 18 percent slopes, moderately eroded**

#### ***Composition***

Gara and similar soils: About 95 percent

Inclusions: About 5 percent

#### ***Setting***

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 14 to 18 percent

#### ***Component Description***

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

#### ***Inclusions***

- Armstrong and similar soils
- Severely eroded areas

#### ***Major Uses of the Unit***

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **179E3—Gara clay loam, 14 to 18 percent slopes, severely eroded**

#### ***Composition***

Gara and similar soils: About 95 percent  
Inclusions: About 5 percent

#### ***Setting***

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 14 to 18 percent

#### ***Component Description***

*Surface layer texture:* Clay loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Glacial till  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)  
*Organic matter content of the surface layer:* About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### ***Inclusions***

- Armstrong and similar soils
- Soils that have a thicker surface layer than the Gara soil

#### ***Major Uses of the Unit***

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **179F—Gara loam, 18 to 25 percent slopes**

#### ***Composition***

Gara and similar soils: 100 percent

#### ***Setting***

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 18 to 25 percent

#### ***Component Description***

*Surface layer texture:* Loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Glacial till  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 10.6 inches (high)  
*Organic matter content of the surface layer:* About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### ***Major Uses of the Unit***

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **179F2—Gara clay loam, 18 to 25 percent slopes, moderately eroded**

#### ***Composition***

Gara and similar soils: 100 percent

#### ***Setting***

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 18 to 25 percent

### **Component Description**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **179G2—Gara clay loam, 25 to 40 percent slopes, moderately eroded**

#### **Composition**

Gara and similar soils: 100 percent

#### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 25 to 40 percent

#### **Component Description**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **993D2—Gara-Armstrong complex, 9 to 14 percent slopes, moderately eroded**

#### **Composition**

Gara and similar soils: About 60 percent

Armstrong and similar soils: About 40 percent

#### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

#### **Component Description**

##### **Gara**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

##### **Armstrong**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 8.8 inches (moderate)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **Gosport Series**

*Drainage class:* Moderately well drained

*Permeability:* Very slow

*Landform:* Uplands

*Parent material:* Residuum derived from shale

*Native vegetation:* Trees

*Slope range:* 9 to 25 percent

#### **Typical Pedon**

Gosport silty clay loam, 9 to 14 percent slopes, moderately eroded, 2,360 feet west and 2,430 feet south of the northeast corner of sec. 32, T. 73 N., R. 21 W.

Ap—0 to 6 inches; silty clay loam, 80 percent brown or dark brown (10YR 4/3) and 20 percent yellowish brown (10YR 5/6); 80 percent light yellowish brown (2.5Y 6/4) dry and 20 percent brownish yellow (10YR 6/6) dry; weak fine subangular blocky structure parting to weak fine granular; friable; many fine and medium roots; few dark brown (10YR 3/3) organic coatings on faces of peds; neutral; 3 percent pebbles of shale-siltstone; abrupt smooth boundary.

Bw1—6 to 15 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/8) mottles; weak medium subangular blocky structure parting to moderate fine subangular blocky; friable; common very fine and fine roots; few distinct brown (10YR 5/3) coatings on faces

of peds; common fine rounded iron-manganese concretions; strongly acid; gradual smooth boundary.

Bw2—15 to 21 inches; light brownish gray (2.5Y 6/2) silty clay; many fine prominent reddish yellow (7.5YR 6/8) mottles; weak medium subangular blocky structure parting to moderate thin platy; friable; few medium and common fine roots; few distinct gray (10YR 5/1) coatings in root channels, pores, or both; many fine irregular iron-manganese concretions; very strongly acid; gradual smooth boundary.

Bw3—21 to 36 inches; light brownish gray (2.5Y 6/2) silty clay; many fine prominent strong brown (7.5YR 5/8) mottles; weak medium prismatic structure; firm; common fine roots; few gray (10YR 5/1) coatings in root channels, pores, or both; common fine irregular iron-manganese concretions and few fine platelike ironstone nodules; extremely acid; clear smooth boundary.

2Cr—36 to 60 inches; black (N 2/0) silty clay loam shale; common fine distinct pale brown (10YR 6/3) and few prominent strong brown (7.5YR 5/6) mottles; massive parting to weak thin platy structure; friable; extremely acid.

#### **Range in Characteristics**

*Thickness of the solum:* 20 to 40 inches

*Depth to shale:* 30 to 40 inches

#### *A horizon:*

Hue—10YR

Value—3 or 4

Chroma—2 or 3

Texture—silty clay loam or silt loam

#### *E horizon (if it occurs):*

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—silt loam or silty clay loam

#### *Bw horizon:*

Hue—10YR to 5Y

Value—5 or 6

Chroma—2 to 4

Texture—silty clay loam or silty clay

#### *2Cr horizon:*

Hue—2.5Y, 5Y, or neutral

Value—2 to 5

Chroma—0 to 2

Texture—silty clay loam or silty clay



**313D2—Gosport silty clay loam, 9 to 14 percent slopes, moderately eroded****Composition**

Gosport and similar soils: About 90 percent  
Inclusions: About 10 percent

**Setting**

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 9 to 14 percent

**Component Description**

*Surface layer texture:* Silty clay loam  
*Depth to bedrock:* 20 to 40 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Residuum derived from shale  
*Flooding:* None  
*Depth to the water table:* 1.5 to 3.0 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 4.8 inches (low)  
*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

**Inclusions**

- Areas of calcareous soils
- Severely eroded areas

**Major Uses of the Unit**

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

**313E2—Gosport silty clay loam, 14 to 18 percent slopes, moderately eroded****Composition**

Gosport and similar soils: About 90 percent

Inclusions: About 10 percent

**Setting**

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 14 to 18 percent

**Component Description**

*Surface layer texture:* Silty clay loam  
*Depth to bedrock:* 20 to 40 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Residuum derived from shale  
*Flooding:* None  
*Depth to the water table:* 1.5 to 3.0 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 4.8 inches (low)  
*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

**Inclusions**

- Areas of calcareous soils
- Severely eroded areas

**Major Uses of the Unit**

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

**313F—Gosport silt loam, 18 to 25 percent slopes****Composition**

Gosport and similar soils: About 90 percent  
Inclusions: About 10 percent

**Setting**

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes  
*Slope:* 18 to 25 percent

### **Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* 20 to 40 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Residuum derived from shale  
*Flooding:* None  
*Depth to the water table:* 1.5 to 3.0 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 5.3 inches (low)  
*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Inclusions**

- Areas of calcareous soils

### **Major Uses of the Unit**

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## **313F2—Gosport silty clay loam, 18 to 25 percent slopes, moderately eroded**

### **Composition**

Gosport and similar soils: About 90 percent  
 Inclusions: About 10 percent

### **Setting**

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 18 to 25 percent

### **Component Description**

*Surface layer texture:* Silty clay loam  
*Depth to bedrock:* 20 to 40 inches  
*Drainage class:* Moderately well drained

*Dominant parent material:* Residuum derived from shale

*Flooding:* None

*Depth to the water table:* 1.5 to 3.0 feet

*Kind of water table:* Apparent

*Available water capacity to 60 inches or root-limiting layer:* About 4.8 inches (low)

*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Inclusions**

- Areas of calcareous soils
- Severely eroded areas

### **Major Uses of the Unit**

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## **Grundy Series**

*Drainage class:* Somewhat poorly drained

*Permeability:* Slow

*Landform:* Uplands

*Parent material:* Loess

*Native vegetation:* Prairie grasses

*Slope range:* 2 to 5 percent

### **Typical Pedon**

Grundy silty clay loam, 2 to 5 percent slopes, 2,370 feet north and 1,020 feet east of the southwest corner of sec. 26, T. 72 N., R. 22 W.

Ap—0 to 8 inches; silty clay loam, 50 percent black (10YR 2/1) and 50 percent black (N 2/0); dark gray (10YR 4/1) dry; moderate fine granular structure; friable; common medium and many very fine and fine roots; neutral; clear smooth boundary.

A—8 to 12 inches; black (10YR 2/1) silty clay loam; 70 percent dark gray (10YR 4/1) dry and 30 percent grayish brown (10YR 5/2) dry; moderate very fine and fine granular structure; friable; few medium and many very fine and fine roots; very

few very dark grayish brown (10YR 3/2) coatings; neutral; clear smooth boundary.

BA—12 to 15 inches; brown or dark brown (10YR 4/3), very dark gray (10YR 3/1) exterior silty clay loam; moderate very fine and fine subangular blocky structure; firm; few medium and many very fine and fine roots; few black (10YR 2/1) organic coatings and few faint dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; few fine rounded iron-manganese concretions; neutral; clear smooth boundary.

Btg1—15 to 20 inches; dark grayish brown (10YR 4/2) silty clay; common fine distinct yellowish brown (10YR 5/6) and brown or dark brown (7.5YR 4/4) mottles; moderate fine prismatic structure parting to moderate very fine and fine subangular blocky; firm; few medium and many very fine and fine roots; few very dark gray (10YR 3/1) organic coatings and few faint very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Btg2—20 to 26 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine distinct yellowish brown (10YR 5/6 and 5/4) and many olive brown (2.5Y 4/4) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine and fine roots; few prominent dark gray (10YR 4/1) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Btg3—26 to 35 inches; grayish brown (2.5Y 5/2) silty clay; common fine prominent strong brown (7.5YR 5/6) and distinct light olive brown (2.5Y 5/6) and olive brown (2.5Y 4/4) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine and fine roots; few dark gray (10YR 4/1) organic coatings in root channels, pores, or both; few distinct dark grayish brown (2.5Y 4/2) clay films (cutans) on faces of peds; common fine and medium rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Btg4—35 to 44 inches; olive gray (5Y 5/2) silty clay loam; many fine and medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few very fine and fine roots; few faint dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; many fine

and medium rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Btg5—44 to 49 inches; olive gray (5Y 5/2) silty clay loam; many medium and coarse prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure parting to weak medium and coarse subangular blocky; firm; few very fine and fine roots; few distinct olive gray (5Y 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Btg6—49 to 55 inches; olive gray (5Y 5/2) silty clay loam; many fine and medium prominent strong brown (7.5YR 4/6) mottles; weak medium and coarse prismatic structure; friable; few very fine and fine roots; very few faint olive gray (5Y 4/2) clay films (cutans) on faces of peds; common fine and medium rounded iron-manganese concretions; neutral; gradual smooth boundary.

C—55 to 60 inches; light olive gray (5Y 6/2) silt loam; many fine and medium prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) mottles; massive; friable; few very fine and fine roots; very few dark reddish brown (5YR 3/2) coatings; many fine and medium rounded iron-manganese concretions; neutral.

#### Range in Characteristics

*Thickness of the solum:* 40 to 60 inches

*Thickness of the mollic epipedon:* 12 to 17 inches

#### *A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1

Texture—silty clay loam or silt loam

#### *Btg horizon:*

Hue—10YR to 5Y

Value—3 or 4

Chroma—1 or 2

Texture—silty clay or silty clay loam

#### *C horizon:*

Hue—10YR to 5Y

Value—4 to 6

Chroma—1 or 2

Texture—silt loam or silty clay loam

### 364B—Grundy silty clay loam, 2 to 5 percent slopes

#### *Composition*

Grundy and similar soils: About 95 percent

Inclusions: About 5 percent

### **Setting**

*Landform:* Uplands

*Geomorphic component:* Interfluves, head slopes, nose slopes, and side slopes

*Hillslope position:* Shoulders and summits

*Slope:* 2 to 5 percent

### **Component Description**

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Loess

*Flooding:* None

*Depth to the water table:* 1.5 to 3.0 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 10.0 inches (high)

*Organic matter content of the surface layer:* About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Inclusions**

- Haig and similar soils

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **Haig Series**

*Drainage class:* Poorly drained

*Permeability:* Slow

*Landform:* Upland flats

*Parent material:* Loess

*Native vegetation:* Prairie grasses

*Slope range:* 0 to 2 percent

### **Typical Pedon**

Haig silt loam, 0 to 2 percent slopes, 2,385 feet south and 495 feet west of the northeast corner of sec. 27, T. 72 N., R. 22 W.

Ap—0 to 7 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common medium and many very fine and fine roots; neutral; clear smooth boundary.

A1—7 to 15 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate very fine and fine granular structure; friable; few medium and many very fine and fine roots; very few gray (10YR 5/1) coatings; neutral; clear smooth boundary.

A2—15 to 21 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; common fine distinct yellowish brown (10YR 5/4) mottles; moderate very fine and fine subangular blocky structure parting to weak fine granular; firm; few medium and many very fine and fine roots; few gray (10YR 5/1) coatings; few fine rounded iron-manganese concretions; neutral; clear smooth boundary.

Btg1—21 to 26 inches; dark gray (10YR 4/1) silty clay; common fine distinct yellowish brown (10YR 5/4 and 5/6) and few prominent reddish brown (5YR 4/4) mottles; moderate very fine and fine subangular blocky structure; very firm; common very fine and fine roots; few black (10YR 2/1) organic coatings and few faint black (10YR 2/1) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

Btg2—26 to 34 inches; dark gray (10YR 4/1) silty clay; many fine distinct olive brown (2.5Y 4/4), common yellowish brown (10YR 5/6), and few prominent brown or dark brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; very firm; few very fine and fine roots; few black (10YR 2/1) organic coatings and few distinct very dark gray (10YR 3/1) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Btg3—34 to 42 inches; dark gray (5Y 4/1) silty clay; common fine prominent strong brown (7.5YR 5/6) and reddish brown (5YR 4/4) and distinct light olive brown (2.5Y 5/4) mottles; moderate medium prismatic structure parting to weak fine and medium subangular blocky; firm; few very fine and fine roots; few very dark gray (10YR 3/1) organic coatings and few distinct dark gray (10YR 4/1) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Btg4—42 to 51 inches; gray (5Y 5/1) silty clay loam;

common medium prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure; firm; few very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct dark gray (5Y 4/1) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

Btg5—51 to 60 inches; light olive gray (5Y 6/2) silty clay loam; common medium prominent strong brown (7.5YR 5/6) and fine distinct light olive brown (2.5Y 5/4) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few very fine and fine roots; very few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few faint olive gray (5Y 5/2) and olive gray (5Y 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral.

#### Range in Characteristics

*Thickness of the solum:* 52 to 60 inches

*Thickness of the mollic epipedon:* 20 to 27 inches

*Depth to carbonates:* Greater than 60 inches

*A horizon:*

Hue—10YR, 2.5Y, or neutral

Value—2 or 3

Chroma—0 or 1

Texture—silt loam or silty clay loam

*Bt horizon:*

Hue—10YR to 5Y

Value—3 to 5

Chroma—1 or 2

Texture—silty clay or silty clay loam

### 362—Haig silt loam, 0 to 2 percent slopes

#### Composition

Haig and similar soils: About 90 percent

Inclusions: About 10 percent

#### Setting

*Landform:* Upland flats

*Geomorphic component:* Divides

*Hillslope position:* Summits

*Slope:* 0 to 2 percent

#### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Poorly drained

*Dominant parent material:* Loess

*Flooding:* None

*Water table:* At the surface to 1 foot below the surface

*Kind of water table:* Apparent

*Available water capacity to 60 inches or root-limiting layer:* About 10.3 inches (high)

*Organic matter content of the surface layer:* About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### Inclusions

- Edina and similar soils

#### Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

#### Humeston Series

*Drainage class:* Poorly drained

*Permeability:* Very slow

*Landform:* Flood plains

*Parent material:* Local alluvium

*Native vegetation:* Prairie grasses and scattered trees

*Slope range:* 0 to 2 percent

#### Typical Pedon

Humeston silty clay loam, 0 to 2 percent slopes, 2,475 feet south and 1,980 feet east of the northwest corner of sec. 30, T. 72 N., R. 21 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate very fine and fine subangular blocky structure parting to moderate fine granular; friable; many medium and fine roots; slightly acid; clear smooth boundary.

A—9 to 14 inches; black (10YR 2/1) silty clay loam; 80 percent dark gray (10YR 4/1) dry and 20 percent light gray (10YR 7/2) dry; weak fine and medium subangular blocky structure; friable; common medium and many very fine and fine roots; slightly acid; clear smooth boundary.

E1—14 to 19 inches; dark gray (10YR 4/1) silt loam;

30 percent light gray (10YR 7/2) dry and 70 percent light brownish gray (10YR 6/2) dry; moderate thick platy structure; friable; common medium and many very fine and fine roots; few very dark grayish brown (10YR 3/2) organic coatings in root channels, pores, or both; few light gray (10YR 7/2) coatings; common fine rounded iron-manganese concretions; strongly acid; clear smooth boundary.

E2—19 to 24 inches; silt loam, 50 percent dark gray (10YR 4/1) and 50 percent gray (10YR 5/1); 60 percent light gray (10YR 7/2) dry and 40 percent light brownish gray (10YR 6/2) dry; common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium platy structure; friable; few medium and many very fine and fine roots; few very dark grayish brown (10YR 3/2) organic coatings in root channels, pores, or both; few white (10YR 8/2) coatings; common fine rounded iron-manganese concretions; very strongly acid; clear smooth boundary.

EB—24 to 28 inches; silty clay loam, 50 percent gray (10YR 5/1) and 50 percent very dark gray (10YR 3/1); common fine distinct dark yellowish brown (10YR 4/4) mottles; weak thick platy structure parting to weak medium subangular blocky; friable; few medium and many very fine and fine roots; few distinct dark gray (10YR 4/1) clay films (cutans) on faces of peds; few light brownish gray (10YR 6/2) coatings; common fine rounded iron-manganese concretions; very strongly acid; clear smooth boundary.

Bt1—28 to 40 inches; black (10YR 2/1) silty clay; common fine distinct dark grayish brown (10YR 4/2) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few medium and common very fine and fine roots; black (N 2/0) organic coatings on faces of peds; few distinct black (N 2/0) and dark grayish brown (10YR 4/2) clay films (cutans); common fine rounded iron-manganese concretions; very strongly acid; gradual smooth boundary.

Bt2—40 to 54 inches; silty clay, 50 percent very dark gray (10YR 3/1) and 50 percent dark gray (5Y 4/1); common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few medium and common very fine and fine roots; few distinct black (10YR 2/1) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

Bt3—54 to 60 inches; silty clay, 50 percent black

(10YR 2/1) and 50 percent dark gray (5Y 4/1); common fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few medium and common very fine and fine roots; few faint black (N 2/0) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral.

#### Range in Characteristics

*Thickness of the solum:* Greater than 60 inches  
*Thickness of the mollic epipedon:* 18 to 24 inches  
*Depth to carbonates:* Greater than 60 inches

#### A horizon:

Hue—10YR or neutral  
 Value—2 or 3  
 Chroma—0 or 1  
 Texture—silt loam or silty clay loam

#### E horizon:

Hue—10YR  
 Value—4 or 5  
 Chroma—1 or 2  
 Texture—silt loam

#### Bt horizon:

Hue—10YR to 5Y  
 Value—3 or 4  
 Chroma—1  
 Texture—silty clay

### 269—Humeston silty clay loam, 0 to 2 percent slopes

#### Composition

Humeston and similar soils: About 95 percent  
 Inclusions: About 5 percent

#### Setting

*Landform:* Flood plains  
*Slope:* 0 to 2 percent

#### Component Description

*Surface layer texture:* Silty clay loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Poorly drained  
*Dominant parent material:* Local alluvium  
*Frequency of flooding:* Occasional  
*Water table:* At the surface to 1 foot below the surface  
*Kind of water table:* Apparent  
*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)  
*Organic matter content of the surface layer:* About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### ***Inclusions***

- Vesser and similar soils

### ***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

## **269+—Humeston silt loam, 0 to 2 percent slopes, overwash**

### ***Composition***

Humeston and similar soils: About 95 percent  
Inclusions: About 5 percent

### ***Setting***

*Landform:* Flood plains  
*Slope:* 0 to 2 percent

### ***Component Description***

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Poorly drained  
*Dominant parent material:* Local alluvium  
*Frequency of flooding:* Occasional  
*Water table:* At the surface to 1 foot below the surface  
*Kind of water table:* Apparent  
*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)  
*Organic matter content of the surface layer:* About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### ***Inclusions***

- Vesser and similar soils

### ***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### ***Keswick Series***

*Drainage class:* Moderately well drained

*Permeability:* Slow

*Landform:* Uplands

*Parent material:* Reddish paleosol weathered from glacial till

*Native vegetation:* Deciduous trees

*Slope range:* 9 to 14 percent

### ***Typical Pedon***

Keswick loam, 9 to 14 percent slopes, 3,050 feet east and 2,780 feet south of the northwest corner of sec. 22, T. 72 N., R. 23 W.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) loam, light gray (10YR 7/2) dry; weak very fine and fine granular structure; friable; few medium and coarse and many very fine and fine roots; moderately acid; abrupt smooth boundary.

E—2 to 6 inches; brown (10YR 5/3) loam; 70 percent white (10YR 8/2) dry and 30 percent very pale brown (10YR 7/3) dry; moderate medium platy structure; friable; few medium and common very fine and fine roots; very strongly acid; abrupt smooth boundary.

Bt1—6 to 10 inches; brown (7.5YR 5/4) clay loam; moderate very fine and fine subangular blocky structure; firm; few medium and common very fine and fine roots; very strongly acid; 2 percent pebbles (mixed); clear smooth boundary.

2Bt2—10 to 13 inches; reddish brown (5YR 5/4) clay; common fine distinct yellowish red (5YR 4/6 and 5/8) and brown or dark brown (7.5YR 4/2) mottles; moderate very fine and fine subangular blocky structure parting to moderate very fine and fine angular blocky; firm; few medium and common very fine and fine roots; few distinct reddish brown (5YR 4/4) clay films (cutans) on faces of peds; very strongly acid; 5 percent pebbles (mixed); clear smooth boundary.

2Bt3—13 to 17 inches; reddish brown (5YR 4/4) clay; common fine distinct yellowish red (5YR 4/6 and

5/8) and dark reddish gray (5YR 4/2) mottles; moderate very fine and fine subangular blocky structure parting to moderate very fine and fine angular blocky; firm; few very coarse, few medium, and common very fine and fine roots; few distinct dark reddish brown (5YR 3/4) clay films (cutans) on faces of peds; very strongly acid; 5 percent pebbles (mixed); clear smooth boundary.

2Bt4—17 to 23 inches; brown or dark brown (7.5YR 4/4) clay; common fine distinct strong brown (7.5YR 4/6 and 5/8) and grayish brown (10YR 5/2) and prominent yellowish red (5YR 4/6) and reddish brown (5YR 4/4) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; few very fine and fine roots; few distinct brown or dark brown (7.5YR 4/2) and brown or dark brown (10YR 4/3) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; very strongly acid; 5 percent pebbles (mixed); gradual smooth boundary.

2Bt5—23 to 29 inches; clay loam, 50 percent strong brown (7.5YR 5/6) and 50 percent light brownish gray (10YR 6/2); many fine distinct reddish brown (5YR 4/4) and yellowish red (5YR 4/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; few very fine and fine roots; few distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; strongly acid; 5 percent pebbles (mixed); gradual smooth boundary.

2Bt6—29 to 34 inches; clay loam, 50 percent light brownish gray (2.5Y 6/2) and 50 percent yellowish brown (10YR 5/6); common fine distinct strong brown (7.5YR 4/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few very fine and fine roots; few distinct grayish brown (10YR 5/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; strongly acid; 2 percent pebbles (mixed); gradual smooth boundary.

2Bt7—34 to 42 inches; clay loam, 50 percent light brownish gray (2.5Y 6/2) and 50 percent yellowish brown (10YR 5/4); common fine distinct brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few distinct

grayish brown (10YR 5/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; moderately acid; 2 percent pebbles (mixed); gradual smooth boundary.

2Bt8—42 to 52 inches; clay loam, 50 percent light brownish gray (2.5Y 6/2) and 50 percent yellowish brown (10YR 5/4); common fine distinct brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6 and 5/8) mottles; moderate medium prismatic structure; firm; few distinct grayish brown (10YR 5/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly acid; 1 percent pebbles (mixed); gradual smooth boundary.

2BC—52 to 60 inches; clay loam, 50 percent light brownish gray (2.5Y 6/2) and 50 percent grayish brown (10YR 5/2); common fine distinct brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6 and 5/8) mottles; weak medium prismatic structure; firm; few distinct grayish brown (10YR 5/2) clay films (cutans) on faces of peds; few fine irregular carbonate nodules and common fine rounded iron-manganese concretions; slightly effervescent; slightly alkaline.

#### Range in Characteristics

*Thickness of the solum:* 45 to 60 inches

*Depth to carbonates:* 45 to 60 inches

#### A horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—loam or clay loam

#### E horizon:

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—loam

#### Bt horizon:

Hue—5YR to 2.5Y

Value—4 or 5

Chroma—4 to 6

Texture—clay or clay loam

#### 2BC horizon:

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—1 to 6

Texture—clay loam or loam



### 425D—Keswick loam, 9 to 14 percent slopes

#### **Composition**

Keswick and similar soils: About 95 percent  
Inclusions: About 5 percent

#### **Setting**

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 9 to 14 percent

#### **Component Description**

*Surface layer texture:* Loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Reddish paleosol weathered from glacial till  
*Flooding:* None  
*Depth to the water table:* 1 to 3 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 8.5 inches (moderate)  
*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### **Inclusions**

- Poorly drained soil areas

#### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### 425D2—Keswick clay loam, 9 to 14 percent slopes, moderately eroded

#### **Composition**

Keswick and similar soils: About 95 percent

Inclusions: About 5 percent

#### **Setting**

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 9 to 14 percent

#### **Component Description**

*Surface layer texture:* Clay loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Reddish paleosol weathered from glacial till  
*Flooding:* None  
*Depth to the water table:* 1 to 3 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 8.4 inches (moderate)  
*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### **Inclusions**

- Poorly drained soil areas

#### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

#### **Lamoni Series**

*Drainage class:* Somewhat poorly drained  
*Permeability:* Slow  
*Landform:* Uplands  
*Parent material:* Gray paleosol weathered from glacial till  
*Native vegetation:* Prairie grasses  
*Slope range:* 5 to 14 percent

### Typical Pedon

Lamoni silty clay loam, 5 to 9 percent slopes, 660 feet south and 330 feet west of the northeast corner of sec. 14, T. 71 N., R. 20 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate very fine and fine granular structure; friable; common medium and many very fine and fine roots; moderately acid; clear smooth boundary.

A—9 to 14 inches; black (10YR 2/1) clay loam; 50 percent dark gray (10YR 4/1) dry and 50 percent grayish brown (10YR 5/2) dry; weak very fine and fine subangular blocky structure parting to moderate fine granular; friable; few medium and many very fine and fine roots; moderately acid; gradual smooth boundary.

BA—14 to 18 inches; very dark gray (10YR 3/1) clay loam; few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate very fine and fine subangular blocky structure; firm; few medium and many very fine and fine roots; few distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; few fine rounded iron-manganese concretions; moderately acid; gradual smooth boundary.

Bt1—18 to 24 inches; brown or dark brown (10YR 4/3) clay; common fine distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; many very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; moderately acid; gradual smooth boundary.

Bt2—24 to 33 inches; grayish brown (2.5Y 5/2) clay; common fine distinct dark yellowish brown (10YR 4/6) and strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common very fine and fine roots; few dark gray (10YR 4/1) organic coatings in root channels, pores, or both; common distinct dark grayish brown (2.5Y 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Bt3—33 to 42 inches; clay, 50 percent light brownish gray (2.5Y 6/2) and 50 percent dark yellowish

brown (10YR 4/6); common fine distinct strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few very fine and fine roots; few distinct dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Bt4—42 to 53 inches; light brownish gray (2.5Y 6/2) clay loam; common fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; firm; few very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct grayish brown (2.5Y 5/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

BC—53 to 60 inches; yellowish brown (10YR 5/6) clay loam; many fine distinct strong brown (7.5YR 4/6) and light brownish gray (2.5Y 6/2) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few very fine and fine roots; few faint dark yellowish brown (10YR 4/4) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral.

### Range in Characteristics

*Thickness of the solum:* 48 to more than 60 inches

*Thickness of the mollic epipedon:* 10 to 16 inches

*Depth to carbonates:* 48 or more inches

#### A horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silty clay loam or clay loam

#### Bt horizon:

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—2 to 4

Texture—clay or clay loam

#### BC horizon:

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—2 to 6

Texture—clay loam or loam

## 470D2—Lamoni-Shelby complex, 9 to 14 percent slopes, moderately eroded

### **Composition**

Lamoni and similar soils: About 70 percent  
Shelby and similar soils: About 30 percent

### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

### **Component Description**

#### **Lamoni**

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.5 inches (high)

*Organic matter content of the surface layer:* About 2.7 percent (moderate)

#### **Shelby**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)

*Organic matter content of the surface layer:* About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

## 822C—Lamoni silty clay loam, 5 to 9 percent slopes

### **Composition**

Lamoni and similar soils: About 95 percent  
Inclusions: About 5 percent

### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 5 to 9 percent

### **Component Description**

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Gray paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.7 inches (high)

*Organic matter content of the surface layer:* About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Inclusions**

- Clarinda and similar soils

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **822C2—Lamoni silty clay loam, 5 to 9 percent slopes, moderately eroded**

#### **Composition**

Lamoni and similar soils: About 95 percent

Inclusions: About 5 percent

#### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 5 to 9 percent

#### **Component Description**

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Gray paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.5 inches (high)

*Organic matter content of the surface layer:* About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### **Inclusions**

- Clarinda and similar soils
- Severely eroded areas

#### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **822D—Lamoni silty clay loam, 9 to 14 percent slopes**

#### **Composition**

Lamoni and similar soils: About 95 percent

Inclusions: About 5 percent

#### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

#### **Component Description**

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Gray paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.7 inches (high)

*Organic matter content of the surface layer:* About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### **Inclusions**

- Clarinda and similar soils

#### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **822D2—Lamoni silty clay loam, 9 to 14 percent slopes, moderately eroded**

#### **Composition**

Lamoni and similar soils: About 95 percent

Inclusions: About 5 percent

#### **Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

### **Component Description**

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Gray paleosol weathered from glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.5 inches (high)

*Organic matter content of the surface layer:* About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Inclusions**

- Clarinda and similar soils
- Severely eroded areas

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **Lawson Series**

*Drainage class:* Somewhat poorly drained

*Permeability:* Moderate

*Landform:* Flood plains

*Parent material:* Silty alluvium

*Native vegetation:* Prairie grasses and trees

*Slope range:* 0 to 2 percent

### **Typical Pedon**

Lawson silt loam, 0 to 2 percent slopes, 1,815 feet south and 1,980 feet east of the northwest corner of sec. 30, T. 72 N., R. 23 W.

Ap—0 to 9 inches; black (10YR 2/1) silt loam; 80 percent gray (10YR 5/1) dry and 20 percent light brownish gray (10YR 6/2) dry; cloddy structure parting to moderate fine granular; friable;

common medium and many very fine and fine roots; moderately acid; clear smooth boundary.

A1—9 to 14 inches; black (10YR 2/1) silt loam; 80 percent gray (10YR 5/1) dry and 20 percent dark gray (10YR 4/1) dry; moderate very fine and fine subangular blocky structure; friable; common medium and many very fine and fine roots; few light brownish gray (10YR 6/2) and light gray (10YR 7/2) coatings; moderately acid; gradual smooth boundary.

A2—14 to 22 inches; very dark gray (10YR 3/1) silt loam; 50 percent gray (10YR 5/1) dry and 50 percent light brownish gray (10YR 6/2) dry; moderate very fine and fine subangular blocky structure; friable; few medium and common very fine and fine roots; few light brownish gray (10YR 6/2) and light gray (10YR 7/2) coatings; slightly acid; gradual smooth boundary.

A3—22 to 34 inches; very dark grayish brown (10YR 3/2) silt loam; 60 percent light brownish gray (10YR 6/2) dry and 40 percent dark gray (10YR 4/1) dry; moderate very fine and fine subangular blocky structure; friable; common very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few light brownish gray (10YR 6/2) coatings; slightly acid; clear smooth boundary.

C1—34 to 43 inches; silt loam, 50 percent very dark grayish brown (10YR 3/2) and 50 percent dark grayish brown (10YR 4/2); common fine distinct dark yellowish brown (10YR 4/6 and 4/4) mottles; weak very fine and fine subangular blocky structure; friable; common very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few light brownish gray (10YR 6/2) and light gray (10YR 7/2) coatings; slightly acid; gradual smooth boundary.

C2—43 to 53 inches; silty clay loam, 50 percent very dark grayish brown (10YR 3/2) and 50 percent dark grayish brown (10YR 4/2); common fine distinct brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6) mottles; weak very fine and fine subangular blocky structure; friable; few very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; slightly acid; gradual smooth boundary.

C3—53 to 60 inches; silty clay loam, 34 percent very dark grayish brown (10YR 3/2), 33 percent very dark gray (10YR 3/1), and 33 percent dark grayish brown (10YR 4/2); moderate medium and coarse prismatic structure; friable; few very fine and fine roots; moderately acid.

### Range in Characteristics

*Thickness of the solum:* 24 to 36 inches

*Thickness of the mollic epipedon:* 24 to 36 inches

#### A horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

#### C horizon:

Hue—10YR or 2.5Y

Value—3 to 6

Chroma—1 to 3

Texture—silty clay loam or silt loam

## 484—Lawson silt loam, 0 to 2 percent slopes

### Composition

Lawson and similar soils: About 90 percent

Inclusions: About 10 percent

### Setting

*Landform:* Flood plains

*Slope:* 0 to 2 percent

### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Silty alluvium

*Frequency of flooding:* Occasional

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Apparent

*Available water capacity to 60 inches or root-limiting layer:* About 12.0 inches (high)

*Organic matter content of the surface layer:* About 5.2 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### Inclusions

- Areas of poorly drained soils
- Nodaway and similar soils

### Major Uses of the Unit

- Cropland
- Hayland

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## Lindley Series

*Drainage class:* Well drained

*Permeability:* Moderately slow

*Landform:* Uplands

*Parent material:* Glacial till

*Native vegetation:* Trees

*Slope range:* 14 to 40 percent

### Typical Pedon

Lindley loam, 18 to 25 percent slopes, 2,380 feet north and 2,355 feet west of the southeast corner of sec. 22, T. 72 N., R. 23 W.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; moderate very fine and fine granular structure; friable; common fine and medium roots; very strongly acid; clear smooth boundary.

E—4 to 7 inches; yellowish brown (10YR 5/4) loam; 70 percent light gray (10YR 7/2) dry and 30 percent very pale brown (10YR 7/3) dry; moderate medium platy structure parting to moderate thin platy; friable; few fine roots; few dark grayish brown (10YR 4/2) organic coatings in root channels, pores, or both; common fine rounded iron-manganese concretions; very strongly acid; 1 percent pebbles (mixed); clear smooth boundary.

Bt1—7 to 11 inches; yellowish brown (10YR 5/6) clay loam; moderate fine and medium subangular blocky structure; firm; few fine roots; few dark grayish brown (10YR 4/2) organic coatings in root channels, pores, or both; few distinct dark yellowish brown (10YR 4/4) clay films (cutans) on faces of peds and light gray (10YR 7/2) coatings; common fine rounded iron-manganese concretions; 10 percent pebbles (mixed); very strongly acid; clear smooth boundary.

Bt2—11 to 16 inches; yellowish brown (10YR 5/6) clay loam; moderate medium prismatic structure parting to strong fine angular blocky; very firm; few fine roots; few dark grayish brown (10YR 4/2) organic coatings in root channels, pores, or both; common distinct dark yellowish brown (10YR 4/4) clay films (cutans) on faces of peds;

common fine rounded iron-manganese concretions; very strongly acid; 10 percent pebbles (mixed); clear smooth boundary.

Bt3—16 to 24 inches; strong brown (7.5YR 5/6) clay loam; common fine and medium distinct grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; few fine roots; few distinct dark grayish brown (10YR 4/2) organic coatings in root channels, pores, or both; few brown or dark brown (7.5YR 4/4) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; very strongly acid; 10 percent pebbles (mixed); clear smooth boundary.

Bt4—24 to 30 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct grayish brown (2.5Y 5/2) and brown or dark brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; few distinct very dark grayish brown (10YR 3/2) organic coatings in root channels, pores, or both; few prominent dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly acid; 10 percent pebbles (mixed); clear smooth boundary.

Bt5—30 to 35 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few distinct very dark grayish brown (10YR 3/2) organic coatings in root channels, pores, or both; few brown or dark brown (10YR 4/3) clay films (cutans) on faces of peds; common fine and medium irregular soft masses of carbonate and common fine rounded iron-manganese concretions; slightly effervescent; moderately alkaline; 10 percent pebbles (mixed); gradual smooth boundary.

Bt6—35 to 41 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct yellowish brown (10YR 5/6) and grayish brown (2.5Y 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine and medium irregular soft masses of carbonate and common fine rounded iron-manganese concretions; slightly effervescent; moderately alkaline; 10 percent pebbles (mixed); gradual smooth boundary.

BC—41 to 60 inches; clay loam, 50 percent yellowish brown (10YR 5/4) and 50 percent grayish brown (2.5Y 5/2); common fine distinct yellowish brown (10YR 5/6) and light brownish gray (2.5Y 6/2) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; very few distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine and medium irregular soft masses of carbonate and common fine rounded iron-manganese concretions; strongly effervescent; moderately alkaline; 10 percent pebbles (mixed).

#### Range in Characteristics

*Thickness of the solum:* 36 to 60 inches

*Depth to carbonates:* 36 to 60 inches

#### A horizon:

Hue—10YR

Value—3 or 4

Chroma—1 or 2

Texture—loam or clay loam

#### E horizon:

Hue—10YR

Value—4 to 6

Chroma—2 to 4

Texture—loam

#### Bt horizon:

Hue—10YR or 7.5YR

Value—4 to 6

Chroma—3 to 6

Texture—clay loam or loam

#### BC horizon:

Hue—2.5Y to 7.5YR

Value—5 or 6

Chroma—2 to 6

Texture—clay loam or loam

### 65E—Lindley loam, 14 to 18 percent slopes

#### Composition

Lindley and similar soils: About 95 percent

Inclusions: About 5 percent

#### Setting

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 14 to 18 percent

### **Component Description**

*Surface layer texture:* Loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Glacial till  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 9.3 inches (high)  
*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Inclusions**

- Keswick and similar soils

### **Major Uses of the Unit**

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **65E2—Lindley loam, 14 to 18 percent slopes, moderately eroded**

#### **Composition**

Lindley and similar soils: About 95 percent  
 Inclusions: About 5 percent

#### **Setting**

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 14 to 18 percent

#### **Component Description**

*Surface layer texture:* Loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Glacial till  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 9.2 inches (high)  
*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Inclusions**

- Keswick and similar soils
- Severely eroded areas

### **Major Uses of the Unit**

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **65F—Lindley loam, 18 to 25 percent slopes**

#### **Composition**

Lindley and similar soils: About 95 percent  
 Inclusions: About 5 percent

#### **Setting**

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 18 to 25 percent

#### **Component Description**

*Surface layer texture:* Loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Glacial till  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 9.3 inches (high)  
*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in



this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

### ***Inclusions***

- Gosport and similar soils

### ***Major Uses of the Unit***

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## **65F2—Lindley loam, 18 to 25 percent slopes, moderately eroded**

### ***Composition***

Lindley and similar soils: About 95 percent  
Inclusions: About 5 percent

### ***Setting***

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 18 to 25 percent

### ***Component Description***

*Surface layer texture:* Loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Glacial till  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 9.2 inches (high)  
*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

### ***Inclusions***

- Gosport and similar soils
- Severely eroded areas

## ***Major Uses of the Unit***

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## **65G—Lindley loam, 25 to 40 percent slopes**

### ***Composition***

Lindley and similar soils: About 95 percent  
Inclusions: About 5 percent

### ***Setting***

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 25 to 40 percent

### ***Component Description***

*Surface layer texture:* Loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Glacial till  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 9.3 inches (high)  
*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

### ***Inclusions***

- Gosport and similar soils

### ***Major Uses of the Unit***

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## 65G2—Lindley loam, 25 to 40 percent slopes, moderately eroded

### Composition

Lindley and similar soils: About 95 percent  
Inclusions: About 5 percent

### Setting

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 25 to 40 percent

### Component Description

*Surface layer texture:* Loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 9.2 inches (high)

*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### Inclusions

- Gosport and similar soils
- Severely eroded areas

### Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### Lineville Series

*Drainage class:* Moderately well drained

*Permeability:* Slow

*Landform:* Uplands

*Parent material:* Pedisidiment over a reddish paleosol weathered from glacial till

*Native vegetation:* Mixed prairie grasses and deciduous trees

*Slope range:* 5 to 9 percent

### Typical Pedon

Lineville silt loam, 5 to 9 percent slopes, 330 feet south and 1,270 feet west of the northeast corner of sec. 19, T. 72 N., R. 23 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate very fine and fine granular structure; friable; common medium and many very fine and fine roots; slightly acid; clear smooth boundary.

E—7 to 11 inches; brown or dark brown (10YR 4/3) silt loam; 60 percent light brownish gray (10YR 6/2) dry and 40 percent pale brown (10YR 6/3) dry; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium platy structure; friable; common medium and many very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few very dark grayish brown (10YR 3/2) coatings on faces of peds; slightly acid; clear smooth boundary.

BE—11 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure parting to moderate very fine and fine subangular blocky; friable; few medium and many very fine and fine roots; few distinct brown or dark brown (10YR 4/3) clay films (cutans) on faces of peds; few fine rounded iron-manganese concretions; slightly acid; clear smooth boundary.

Bt1—15 to 19 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine and fine subangular blocky structure; friable; few medium and many very fine and fine roots; few distinct brown or dark brown (10YR 4/3) clay films (cutans) on faces of peds and few light gray (10YR 7/1) coatings; few fine rounded iron-manganese concretions; slightly acid; clear smooth boundary.

2Bt2—19 to 26 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct brown or dark brown (7.5YR 4/4) mottles; moderate fine and medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few medium and many very fine and fine roots; few distinct dark yellowish brown (10YR 4/4) clay films (cutans) on faces of peds and few light gray (10YR 7/1) coatings; common fine rounded iron-manganese concretions; neutral; 1 percent pebbles (mixed); clear smooth boundary.

2Bt3—26 to 29 inches; clay loam, 50 percent yellowish brown (10YR 5/6) and 50 percent light yellowish brown (10YR 6/4); common fine distinct brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine and fine roots; pebble band at a depth of 29 inches; few distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; 10 percent pebbles (mixed); clear smooth boundary.

3Bt4—29 to 39 inches; strong brown (7.5YR 5/6) clay; many fine prominent dark reddish brown (2.5YR 3/4) and red (2.5YR 4/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct dark yellowish brown (10YR 4/4) and brown or dark brown (7.5YR 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; 10 percent pebbles (mixed); gradual smooth boundary.

3Bt5—39 to 47 inches; strong brown (7.5YR 5/6) clay; common fine distinct yellowish red (5YR 4/6 and 5/8) and few fine and medium prominent grayish brown (2.5Y 5/2) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common very fine and fine roots; few distinct dark yellowish brown (10YR 4/4) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly alkaline; 10 percent pebbles (mixed); gradual smooth boundary.

3Bt6—47 to 55 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct strong brown (7.5YR 4/6 and 5/8) and fine and medium grayish brown (2.5Y 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few very fine and fine roots; few distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly alkaline; 10 percent pebbles (mixed); gradual smooth boundary.

3Bt7—55 to 60 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct strong brown (7.5YR 4/6 and 5/8) and few fine and medium grayish brown (2.5Y 5/2) mottles; weak medium prismatic structure parting to weak medium

subangular blocky; firm; few very fine and fine roots; few faint dark yellowish brown (10YR 4/4) clay films (cutans) on faces of peds; common fine and medium rounded iron-manganese concretions; slightly alkaline.

#### Range in Characteristics

*Thickness of the solum:* Greater than 45 inches

*Depth to carbonates:* 72 or more inches

#### A horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

#### E horizon:

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—silt loam

#### B horizon:

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—silty clay loam or silt loam

#### 2Bt horizon:

Hue—10YR or 7.5YR

Value—4 or 5

Chroma—2 or 3

Texture—clay loam or silty clay loam

#### 3Bt horizon:

Hue—5YR to 10YR

Value—4 or 5

Chroma—4 to 6

Texture—clay or clay loam

### 452C—Lineville silt loam, 5 to 9 percent slopes

#### Composition

Lineville and similar soils: 100 percent

#### Setting

*Landform:* Uplands

*Geomorphic component:* Side slopes and nose slopes

*Hillslope position:* Shoulders and backslopes

*Slope:* 5 to 9 percent

#### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Pedisements over a reddish paleosol weathered from glacial till  
*Flooding:* None  
*Depth to the water table:* 1 to 3 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 10.8 inches (high)  
*Organic matter content of the surface layer:* About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## **452C2—Lineville silt loam, 5 to 9 percent slopes, moderately eroded**

### **Composition**

Lineville and similar soils: 100 percent

### **Setting**

*Landform:* Uplands  
*Geomorphic component:* Side slopes and nose slopes  
*Hillslope position:* Shoulders and backslopes  
*Slope:* 5 to 9 percent

### **Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Pedisements over a reddish paleosol weathered from glacial till  
*Flooding:* None  
*Depth to the water table:* 1 to 3 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 10.8 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## **Mystic Series**

*Drainage class:* Somewhat poorly drained  
*Permeability:* Slow  
*Landform:* Stream terraces  
*Parent material:* Red paleosol weathered from old valley alluvium  
*Native vegetation:* Mixed prairie grasses and deciduous trees  
*Slope range:* 5 to 18 percent

### **Typical Pedon**

Mystic clay loam, 9 to 14 percent slopes, moderately eroded, 1,120 feet east and 1,430 feet south of the northwest corner of sec. 5, T. 72 N., R. 22 W.

Ap—0 to 5 inches; clay loam, 85 percent very dark grayish brown (10YR 3/2) and 15 percent dark yellowish brown (10YR 4/4); 60 percent grayish brown (10YR 5/2) dry and 40 percent light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; common fine roots; few faint very dark gray (10YR 3/1) organic coatings on faces of peds; neutral; clear smooth boundary.  
 BE—5 to 9 inches; brown or dark brown (10YR 4/3), dark grayish brown (10YR 4/2) exterior clay loam; few fine distinct yellowish brown (10YR 5/6) and common prominent reddish brown (5YR 4/4) mottles; moderate fine subangular blocky structure parting to moderate fine granular; friable; common fine roots; few distinct very dark gray (10YR 3/1) organic coatings on faces of peds; neutral; clear smooth boundary.

Bt1—9 to 15 inches; brown or dark brown (10YR 4/3) clay; common fine prominent red (2.5YR 4/6) and distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; distinct dark grayish brown (10YR 4/2) and dark gray (10YR 4/1) clay films (cutans) on faces of peds; common fine rounded dark concretions; neutral; 1 percent pebbles; gradual smooth boundary.

Bt2—15 to 24 inches; brown (10YR 5/3) clay; common fine prominent dark yellowish brown (10YR 4/6) and many yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to moderate very fine and fine subangular blocky; firm; few fine roots; few prominent grayish brown (2.5Y 5/2) clay films (cutans) on faces of peds; common fine rounded dark concretions; neutral; gradual smooth boundary.

Bt3—24 to 31 inches; yellowish brown (10YR 5/6) clay loam; few fine prominent yellowish red (5YR 4/6) mottles; moderate fine and medium prismatic structure; firm; few fine roots; few distinct dark grayish brown (10YR 4/2) clay films (cutans) in root channels, pores, or both; few grayish brown (10YR 5/2) clay films (cutans) on faces of peds; common fine rounded dark concretions; neutral; gradual smooth boundary.

Bt4—31 to 41 inches; clay loam, 80 percent yellowish brown (10YR 5/8) and 20 percent strong brown (7.5YR 5/8); many medium prominent weak red (2.5YR 5/2) and pale red (2.5YR 6/2) mottles; moderate fine and medium prismatic structure; friable; few distinct dark grayish brown (10YR 4/2) clay films (cutans) in root channels, pores, or both; common fine rounded dark concretions; neutral; 1 percent pebbles; gradual smooth boundary.

Bt5—41 to 51 inches; yellowish brown (10YR 5/8) and brownish yellow (10YR 6/8) clay loam; many medium distinct grayish brown (10YR 5/2) and common prominent strong brown (7.5YR 5/6) mottles; moderate fine and medium prismatic structure; friable; pebble band  $\frac{1}{4}$  to  $\frac{1}{2}$  inch in diameter at a depth of 51 inches; few distinct brown or dark brown (10YR 4/3) clay films (cutans) on faces of peds and few brown or dark brown (10YR 4/3) clay films (cutans) in root channels, pores, or both; common fine and medium rounded dark concretions; neutral; 1 percent pebbles; clear smooth boundary.

C—51 to 60 inches; yellowish brown (10YR 5/8 and 5/6) sandy clay loam; common fine distinct light

brownish gray (10YR 6/2) and many prominent strong brown (7.5YR 4/6) mottles; massive; friable; common fine and medium rounded dark concretions; neutral; 1 percent pebbles.

#### **Range in Characteristics**

*Thickness of the solum:* 45 to 60 inches

*Depth to carbonates:* Greater than 60 inches

#### *A horizon:*

Hue—10YR

Value—3

Chroma—1 or 2

Texture—silt loam to clay loam

#### *Bt horizon:*

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—2 to 4

Texture—clay or clay loam

#### *C horizon:*

Hue—7.5YR or 10YR

Value—4 to 6

Chroma—2 to 8

Texture—sandy clay loam to sandy loam

### **94D2—Mystic-Caleb complex, 9 to 14 percent slopes, moderately eroded**

#### ***Composition***

Mystic and similar soils: About 60 percent

Caleb and similar soils: About 40 percent

#### ***Setting***

*Landform:* Stream terraces

*Geomorphic component:* Side slopes

*Hillslope position:* Shoulders and backslopes

*Slope:* 9 to 14 percent

#### ***Component Description***

#### **Mystic**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Old valley alluvium

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 10.7 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

**Caleb**

*Surface layer texture:* Loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Old valley alluvium

*Flooding:* None

*Depth to the water table:* 3 to 5 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.3 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

**Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

**94E2—Mystic-Caleb complex, 14 to 18 percent slopes, moderately eroded****Composition**

Mystic and similar soils: About 60 percent

Caleb and similar soils: About 35 percent

Inclusions: About 5 percent

**Setting**

*Landform:* Stream terraces

*Geomorphic component:* Side slopes

*Hillslope position:* Shoulders and backslopes

*Slope:* 14 to 18 percent

**Component Description****Mystic**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Old valley alluvium

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 10.7 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

**Caleb**

*Surface layer texture:* Loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Old valley alluvium

*Flooding:* None

*Depth to the water table:* 3 to 5 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.3 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

**Inclusions**

- Soils that have a thicker surface layer than the major soils
- Severely eroded areas

**Major Uses of the Unit**

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

**592C2—Mystic clay loam, 5 to 9 percent slopes, moderately eroded****Composition**

Mystic and similar soils: About 90 percent

Inclusions: About 10 percent

**Setting**

*Landform:* Stream terraces

*Geomorphic component:* Side slopes

*Hillslope position:* Shoulders and backslopes

*Slope:* 5 to 9 percent

### **Component Description**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Reddish paleosol weathered from old valley alluvium

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 10.7 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Inclusions**

- Caleb and similar soils
- Severely eroded areas

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## **592D2—Mystic clay loam, 9 to 14 percent slopes, moderately eroded**

### **Composition**

Mystic and similar soils: About 90 percent

Inclusions: About 10 percent

### **Setting**

*Landform:* Stream terraces

*Geomorphic component:* Side slopes

*Hillslope position:* Shoulders and backslopes

*Slope:* 9 to 14 percent

### **Component Description**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Reddish paleosol weathered from old valley alluvium

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 10.7 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Inclusions**

- Soils that have a thinner surface layer than the Mystic soil
- Severely eroded areas
- Soils that have more sand than the Mystic soil

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## **Nodaway Series**

*Drainage class:* Moderately well drained

*Permeability:* Moderate

*Landform:* Flood plains

*Parent material:* Silty alluvium

*Native vegetation:* Mixed prairie grasses and deciduous trees

*Slope range:* 0 to 2 percent

### **Typical Pedon**

Nodaway silt loam, 0 to 2 percent slopes, 1,450 feet north and 115 feet west of the southeast corner of sec. 21, T. 72 N., R. 23 W.

Ap—0 to 8 inches; silt loam, 80 percent very dark grayish brown (10YR 3/2) and 20 percent grayish brown (10YR 5/2); 80 percent grayish brown (10YR 5/2) dry and 20 percent light gray (10YR 7/2) dry; weak fine granular structure; friable;

common medium and many very fine and fine roots; neutral; abrupt smooth boundary.

C1—8 to 13 inches; very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), and pale brown (10YR 6/3) silt loam; massive; friable; common medium and many very fine and fine roots; neutral; abrupt smooth boundary.

C2—13 to 39 inches; dark grayish brown (10YR 4/2), very dark grayish brown (10YR 3/2), and brown (10YR 5/3) silt loam; massive; friable; many medium roots; neutral; abrupt smooth boundary.

C3—39 to 60 inches; very dark gray (10YR 3/1), brown (10YR 5/3), and pale brown (10YR 6/3) silt loam; massive; friable; few medium and common very fine and fine roots; slightly alkaline.

#### **Range in Characteristics**

*Thickness of the solum:* 6 to 10 inches

*A horizon:*

Hue—10YR  
Value—2 or 3  
Chroma—1 or 2  
Texture—silt loam

*C horizon:*

Hue—10YR  
Value—3 or 4  
Chroma—1 to 3  
Texture—silt loam

### **220—Nodaway silt loam, 0 to 2 percent slopes**

#### **Composition**

Nodaway and similar soils: About 90 percent  
Inclusions: About 10 percent

#### **Setting**

*Landform:* Flood plains  
*Slope:* 0 to 2 percent

#### **Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Silty alluvium  
*Frequency of flooding:* Occasional  
*Depth to the water table:* 3 to 5 feet  
*Kind of water table:* Apparent  
*Available water capacity to 60 inches or root-limiting layer:* About 12.9 inches (high)  
*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### **Inclusions**

- Areas of poorly drained soils
- Lawson and similar soils

#### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **711—Nodaway-Lawson complex, 0 to 2 percent slopes**

#### **Composition**

Nodaway and similar soils: About 70 percent  
Lawson and similar soils: About 30 percent

#### **Setting**

*Landform:* Flood plains  
*Slope:* 0 to 2 percent

#### **Component Description**

##### **Nodaway**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Alluvium  
*Frequency of flooding:* Occasional  
*Depth to the water table:* 3 to 5 feet  
*Kind of water table:* Apparent  
*Available water capacity to 60 inches or root-limiting layer:* About 12.9 inches (high)  
*Organic matter content of the surface layer:* About 3.7 percent (moderate)

##### **Lawson**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Somewhat poorly drained  
*Dominant parent material:* Alluvium



*Frequency of flooding:* Occasional  
*Depth to the water table:* 1 to 3 feet  
*Kind of water table:* Apparent  
*Available water capacity to 60 inches or root-limiting layer:* About 12.0 inches (high)  
*Organic matter content of the surface layer:* About 3.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### ***Inclusions***

- Areas of poorly drained soils

### ***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## **1711—Nodaway-Lawson complex, channeled, 0 to 2 percent slopes**

### ***Composition***

Nodaway and similar soils: About 70 percent  
 Lawson and similar soils: About 30 percent

### ***Setting***

*Landform:* Flood plains  
*Slope:* 0 to 2 percent

### ***Component Description***

#### **Nodaway**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Alluvium  
*Frequency of flooding:* Frequent  
*Depth to the water table:* 3 to 5 feet  
*Kind of water table:* Apparent  
*Available water capacity to 60 inches or root-limiting layer:* About 12.9 inches (high)  
*Organic matter content of the surface layer:* About 3.7 percent (moderate)

#### **Lawson**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Somewhat poorly drained  
*Dominant parent material:* Alluvium  
*Frequency of flooding:* Frequent  
*Depth to the water table:* 1 to 3 feet  
*Kind of water table:* Apparent  
*Available water capacity to 60 inches or root-limiting layer:* About 12.0 inches (high)  
*Organic matter content of the surface layer:* About 3.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### ***Inclusions***

- Oxbows
- Depressional areas

### ***Major Uses of the Unit***

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

#### ***Olmitz Series***

*Drainage class:* Moderately well drained  
*Permeability:* Moderate  
*Landform:* Upland drainageways and alluvial fans  
*Parent material:* Local alluvium  
*Native vegetation:* Prairie grasses  
*Slope range:* 2 to 9 percent

### ***Typical Pedon***

Olmitz loam, 2 to 5 percent slopes, 1,600 feet north and 840 feet west of the southeast corner of sec. 15, T. 72 N., R. 23 W.

Ap—0 to 8 inches; black (10YR 2/1) loam, dark grayish brown (10YR 4/2) dry; moderate very fine and fine granular structure; friable; common medium and many very fine and fine roots; moderately acid; clear smooth boundary.  
 A1—8 to 16 inches; black (10YR 2/1) and very dark brown (10YR 2/2) clay loam; very dark grayish

brown (10YR 3/2) dry; weak very fine and fine subangular blocky structure parting to moderate fine granular; friable; common medium and many very fine and fine roots; strongly acid; 1 percent pebbles (mixed); gradual smooth boundary.

A2—16 to 25 inches; very dark brown (10YR 2/2) clay loam, very dark grayish brown (10YR 3/2) dry; moderate very fine and fine subangular blocky structure; friable; few medium and many very fine and fine roots; moderately acid; 10 percent pebbles (mixed); gradual smooth boundary.

A3—25 to 33 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate fine prismatic structure parting to moderate fine subangular blocky; friable; few medium and many very fine and fine roots; few very dark brown (10YR 2/2) organic coatings on faces of peds; slightly acid; 10 percent pebbles (mixed); gradual smooth boundary.

AB—33 to 38 inches; dark brown (10YR 3/3) clay loam, grayish brown (10YR 5/2) dry; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; friable; few medium and common very fine and fine roots; few very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; 10 percent pebbles (mixed); clear smooth boundary.

Bw1—38 to 44 inches; brown or dark brown (10YR 4/3) clay loam; weak medium prismatic structure parting to moderate fine and medium subangular blocky; friable; few medium and common very fine and fine roots; few dark brown (10YR 3/3) organic coatings on faces of peds; few fine rounded iron-manganese concretions; slightly acid; 10 percent pebbles (mixed); clear smooth boundary.

Bw2—44 to 51 inches; brown or dark brown (10YR 4/3) clay loam; weak medium prismatic structure parting to moderate fine and medium subangular blocky; friable; few medium and common very fine and fine roots; few dark brown (10YR 3/3) organic coatings on faces of peds; common fine rounded iron-manganese concretions; neutral; 10 percent pebbles (mixed); gradual smooth boundary.

Bw3—51 to 60 inches; brown or dark brown (10YR 4/3) clay loam; weak medium prismatic structure parting to moderate fine and medium subangular blocky; friable; common very fine and fine roots; common fine rounded iron-manganese concretions; neutral; 10 percent pebbles (mixed).

### Range in Characteristics

*Thickness of the solum:* 40 to 60 inches

*Thickness of the mollic epipedon:* 24 to 40 inches

#### A horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—loam or clay loam

#### Bw horizon:

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—clay loam

## 273B—Olmitz loam, 2 to 5 percent slopes

### Composition

Olmitz and similar soils: 100 percent

### Setting

*Landform:* Alluvial fans

*Geomorphic component:* Base slopes

*Hillslope position:* Footslopes

*Slope:* 2 to 5 percent

### Component Description

*Surface layer texture:* Loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Local alluvium

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.7 inches (high)

*Organic matter content of the surface layer:* About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

## 273C—Olmitz loam, 5 to 9 percent slopes

### **Composition**

Olmitz and similar soils: 100 percent

### **Setting**

*Landform:* Alluvial fans

*Geomorphic component:* Base slopes

*Hillslope position:* Footslopes

*Slope:* 5 to 9 percent

### **Component Description**

*Surface layer texture:* Loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Local alluvium

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.7 inches (high)

*Organic matter content of the surface layer:* About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

## 5021—Orthents, hilly

### **Component Description**

*Surface layer texture:* Loam

*Flooding:* None

*General information:* This map unit consists of rolling to hilly areas from which soil material has been removed for use in other areas.

### **Major Uses of the Unit**

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

## 5040—Orthents, loamy

### **Component Description**

*Surface layer texture:* Loam

*Flooding:* None

*General information:* This map unit consists of nearly level and undulating areas from which soil material has been removed for use in other areas.

### **Major Uses of the Unit**

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

## **Pershing Series**

*Drainage class:* Somewhat poorly drained

*Permeability:* Slow

*Landform:* Uplands and stream terraces

*Parent material:* Loess

*Native vegetation:* Mixed prairie grasses and deciduous trees

*Slope range:* 2 to 14 percent

### **Typical Pedon**

Pershing silt loam, 5 to 9 percent slopes, 230 feet south and 190 feet east of the northwest corner of sec. 31, T. 72 N., R. 21 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam; 70 percent gray (10YR 5/1) dry and 30 percent grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; few medium and many very fine and fine roots; neutral; clear smooth boundary.

E—8 to 11 inches; dark grayish brown (10YR 4/2) silt loam; 70 percent light brownish gray (10YR 6/2) dry and 30 percent gray (10YR 5/1) dry; common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium platy structure; friable; few medium and many very fine and fine roots; few very dark grayish brown (10YR 3/2) organic coatings in root channels, pores, or both; few very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine rounded iron-

manganese concretions; slightly acid; clear smooth boundary.

**Bt1**—11 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; moderate very fine and fine subangular blocky structure; friable; few medium and many very fine and fine roots; few very dark grayish brown (10YR 3/2) organic coatings in root channels, pores, or both; few distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds and few light gray (10YR 7/1) coatings; common fine rounded iron-manganese concretions; moderately acid; clear smooth boundary.

**Bt2**—15 to 20 inches; silty clay, 50 percent yellowish brown (10YR 5/4) and 50 percent grayish brown (10YR 5/2); common fine distinct strong brown (7.5YR 4/6 and 5/8) and brown or dark brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; very firm; few medium and many very fine and fine roots; few distinct very dark grayish brown (10YR 3/2) organic coatings in root channels, pores, or both; few dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds and few light gray (10YR 7/1) coatings; common fine rounded iron-manganese concretions; moderately acid; clear smooth boundary.

**Btg1**—20 to 27 inches; grayish brown (10YR 5/2) silty clay; common fine distinct brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6 and 5/8) mottles; moderate fine and medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; few medium and common very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; moderately acid; gradual smooth boundary.

**Btg2**—27 to 34 inches; grayish brown (2.5Y 5/2) silty clay; common fine faint light brownish gray (2.5Y 6/2) and prominent brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few medium and common very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct dark grayish brown (2.5Y 4/2) clay films (cutans) on faces of peds; many fine and medium rounded iron-manganese

concretions; slightly acid; gradual smooth boundary.

**Btg3**—34 to 45 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine and medium prominent brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few medium and common very fine and fine roots; very few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) clay films (cutans) on faces of peds; common fine and medium rounded iron-manganese concretions; neutral; gradual smooth boundary.

**Btg4**—45 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; many fine and medium prominent brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6 and 5/8) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few very fine and fine roots; very few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few faint grayish brown (2.5Y 5/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral.

#### Range in Characteristics

*Thickness of the solum:* 48 to 60 inches

##### *A horizon:*

Hue—10YR

Value—3

Chroma—1 or 2

Texture—silt loam or silty clay loam

##### *E horizon:*

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—silt loam

##### *Bt horizon:*

Hue—10YR

Value—4 to 6

Chroma—2 to 6

Texture—silty clay or silty clay loam

##### *Btg or C horizon:*

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—2 to 6

Texture—silt loam or silty clay loam

**131B—Pershing silt loam, 2 to 5 percent slopes****Composition**

Pershing and similar soils: About 90 percent  
Inclusions: About 10 percent

**Setting**

*Landform:* Uplands  
*Geomorphic component:* Interfluves  
*Hillslope position:* Summits and shoulders  
*Slope:* 2 to 5 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Somewhat poorly drained  
*Dominant parent material:* Loess  
*Flooding:* None  
*Depth to the water table:* 2 to 4 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 11.9 inches (high)  
*Organic matter content of the surface layer:* About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

**Inclusions**

- Areas of poorly drained soils

**Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

**131C—Pershing silt loam, 5 to 9 percent slopes****Composition**

Pershing and similar soils: 100 percent

**Setting**

*Landform:* Uplands  
*Geomorphic component:* Interfluves, head slopes, nose slopes, and side slopes  
*Hillslope position:* Summits, shoulders, and backslopes  
*Slope:* 5 to 9 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Somewhat poorly drained  
*Dominant parent material:* Loess  
*Flooding:* None  
*Depth to the water table:* 2 to 4 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 11.9 inches (high)  
*Organic matter content of the surface layer:* About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

**Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

**131C2—Pershing silty clay loam, 5 to 9 percent slopes, moderately eroded****Composition**

Pershing and similar soils: 100 percent

**Setting**

*Landform:* Uplands  
*Geomorphic component:* Interfluves, head slopes, nose slopes, and side slopes  
*Hillslope position:* Summits, shoulders, and backslopes  
*Slope:* 5 to 9 percent

### **Component Description**

*Surface layer texture:* Silty clay loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Somewhat poorly drained  
*Dominant parent material:* Loess  
*Flooding:* None  
*Depth to the water table:* 2 to 4 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 11.7 inches (high)  
*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **131D2—Pershing silty clay loam, 9 to 14 percent slopes, moderately eroded**

#### **Composition**

Pershing and similar soils: 100 percent

#### **Setting**

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 9 to 14 percent

#### **Component Description**

*Surface layer texture:* Silty clay loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Somewhat poorly drained  
*Dominant parent material:* Loess  
*Flooding:* None  
*Depth to the water table:* 2 to 4 feet  
*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 11.7 inches (high)  
*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **831B—Pershing silt loam, bench, 2 to 5 percent slopes**

#### **Composition**

Pershing and similar soils: 100 percent

#### **Setting**

*Landform:* Stream terraces  
*Geomorphic component:* Interfluves, head slopes, nose slopes, and side slopes  
*Hillslope position:* Summits, shoulders, and backslopes  
*Slope:* 2 to 5 percent

#### **Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Somewhat poorly drained  
*Dominant parent material:* Loess  
*Flooding:* None  
*Depth to the water table:* 2 to 4 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 11.9 inches (high)  
*Organic matter content of the surface layer:* About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this

map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **831C—Pershing silt loam, bench, 5 to 9 percent slopes**

#### **Composition**

Pershing and similar soils: 100 percent

#### **Setting**

*Landform:* Stream terraces

*Geomorphic component:* Side slopes

*Hillslope position:* Shoulders and backslopes

*Slope:* 5 to 9 percent

#### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Loess

*Flooding:* None

*Depth to the water table:* 2 to 4 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 11.9 inches (high)

*Organic matter content of the surface layer:* About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning

these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **831C2—Pershing silty clay loam, bench, 5 to 9 percent slopes, moderately eroded**

#### **Composition**

Pershing and similar soils: 100 percent

#### **Setting**

*Landform:* Stream terraces

*Geomorphic component:* Interfluves, head slopes, nose slopes, and side slopes

*Hillslope position:* Shoulders and backslopes

*Slope:* 5 to 9 percent

#### **Component Description**

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Loess

*Flooding:* None

*Depth to the water table:* 2 to 4 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 11.7 inches (high)

*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **Rinda Series**

*Drainage class:* Poorly drained

*Permeability:* Very slow

*Landform:* Uplands

*Parent material:* Gray paleosol weathered from glacial till

*Native vegetation:* Mixed prairie grasses and deciduous trees

*Slope range:* 5 to 14 percent

### Typical Pedon

Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded, 1,220 feet north and 2,800 feet west of the southeast corner of sec. 14, T. 72 N., R. 21 W.

Ap—0 to 7 inches; 75 percent very dark grayish brown (10YR 3/2), very dark gray (10YR 3/1) exterior, and 25 percent brown or dark brown (10YR 4/3) silty clay loam; gray (10YR 5/1) dry; weak very fine and fine subangular blocky structure parting to weak fine granular; friable; common fine roots; neutral; clear smooth boundary.

Bt—7 to 1.1 inches; brown or dark brown (10YR 4/3) silty clay; weak medium subangular blocky structure parting to moderate fine subangular blocky; firm; common fine roots; few very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few distinct dark yellowish brown (10YR 4/4) clay films (cutans) and prominent strong brown (7.5YR 4/6) coatings in root channels, pores, or both; slightly acid; clear smooth boundary.

Btg1—11 to 16 inches; grayish brown (10YR 5/2) clay; common fine distinct yellowish brown (10YR 5/6) and few prominent strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; common fine roots; few distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; few fine rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Btg2—16 to 22 inches; grayish brown (2.5Y 5/2) clay; common fine distinct yellowish brown (10YR 5/8) and few prominent strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; common fine roots; few distinct dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; moderately acid; gradual smooth boundary.

Btg3—22 to 35 inches; light brownish gray (2.5Y 6/2) clay; common fine prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/8) mottles; moderate medium and coarse prismatic structure; very firm; few fine roots; few distinct

grayish brown (10YR 5/2) clay films (cutans) on faces of peds; few fine rounded iron-manganese concretions; slightly acid; gradual smooth boundary.

Btg4—35 to 47 inches; clay, 50 percent light brownish gray (2.5Y 6/2) and 50 percent grayish brown (2.5Y 5/2); common fine prominent yellowish brown (10YR 5/8) and few strong brown (7.5YR 5/6) mottles; moderate medium and coarse prismatic structure; very firm; few fine roots; few faint dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; few fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

Btg5—47 to 60 inches; silty clay, 50 percent light brownish gray (2.5Y 6/2) and 50 percent grayish brown (2.5Y 5/2); common medium prominent yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure; very firm; few fine roots; few faint dark grayish brown (10YR 4/2) clay films (cutans) on faces of peds; few black (10YR 2/1) coatings in root channels, pores, or both; common fine and medium irregular iron-manganese concretions; neutral.

### Range in Characteristics

*Thickness of the solum:* Greater than 60 inches

*A horizon:*

Hue—10YR

Value—3

Chroma—1 or 2

Texture—silty clay loam

*E horizon (if it occurs):*

Hue—10YR

Value—4 or 5

Chroma—2

Texture—silt loam or silty clay loam

*Btg horizon:*

Hue—10YR to 5Y

Value—4 to 6

Chroma—1 or 2

Texture—silty clay or clay

## 223C2—Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded

### Composition

Rinda and similar soils: 100 percent

### Setting

*Landform:* Uplands



*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Shoulders and backslopes  
*Slope:* 5 to 9 percent

### **Component Description**

*Surface layer texture:* Silty clay loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Poorly drained  
*Dominant parent material:* Gray paleosol weathered from glacial till  
*Flooding:* None  
*Depth to the water table:* 1 to 3 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 9.6 inches (high)  
*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## **223D2—Rinda silty clay loam, 9 to 14 percent slopes, moderately eroded**

### **Composition**

Rinda and similar soils: 100 percent

### **Setting**

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 9 to 14 percent

### **Component Description**

*Surface layer texture:* Silty clay loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Poorly drained

*Dominant parent material:* Gray paleosol weathered from glacial till  
*Flooding:* None  
*Depth to the water table:* 1 to 3 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 9.6 inches (high)  
*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **Shelby Series**

*Drainage class:* Well drained  
*Permeability:* Moderately slow  
*Landform:* Uplands  
*Parent material:* Glacial till  
*Native vegetation:* Prairie grasses  
*Slope range:* 9 to 25 percent

### **Typical Pedon**

Shelby clay loam, 9 to 14 percent slopes, 30 feet south and 495 feet west of the northeast corner of sec. 14, T. 71 N., R. 20 W.

- Ap—0 to 8 inches; very dark brown (10YR 2/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate very fine and fine granular structure; friable; common medium and many very fine and fine roots; neutral; 1 percent pebbles (mixed); clear smooth boundary.
- A—8 to 11 inches; very dark brown (10YR 2/2) clay loam; 70 percent dark grayish brown (10YR 4/2) dry and 30 percent brown (10YR 5/3) dry; moderate very fine and fine granular structure; friable; few medium and many very fine and fine roots; neutral; 1 percent pebbles (mixed); clear smooth boundary.

BA—11 to 15 inches; clay loam, 50 percent dark yellowish brown (10YR 4/4) and 50 percent very dark grayish brown (10YR 3/2); common fine distinct dark yellowish brown (10YR 4/6) mottles; moderate very fine and fine subangular blocky structure; friable; few medium and many very fine and fine roots; few very dark brown (10YR 2/2) organic coatings on faces of peds and few distinct brown or dark brown (10YR 4/3) clay films (cutans); few fine rounded iron-manganese concretions; slightly acid; 5 percent pebbles (mixed); clear smooth boundary.

Bt1—15 to 20 inches; dark yellowish brown (10YR 4/4) clay loam; common fine distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/8) mottles; moderate very fine and fine subangular blocky structure; firm; many very fine and fine roots; few very dark grayish brown (10YR 3/2) organic coatings on faces of peds and few distinct brown or dark brown (10YR 4/3) clay films (cutans); common fine rounded iron-manganese concretions; moderately acid; 5 percent pebbles (mixed); gradual smooth boundary.

Bt2—20 to 28 inches; dark yellowish brown (10YR 4/4) clay loam; common fine distinct strong brown (7.5YR 4/6 and 5/8) and few grayish brown (10YR 5/2) mottles; moderate fine and medium prismatic structure parting to moderate fine subangular blocky; firm; many very fine and fine roots; few distinct brown or dark brown (10YR 4/3) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; 6 percent pebbles (mixed); gradual smooth boundary.

Bt3—28 to 38 inches; clay loam, 50 percent dark yellowish brown (10YR 4/4) and 50 percent yellowish brown (10YR 5/4); common fine distinct strong brown (7.5YR 4/6 and 5/8) and grayish brown (2.5Y 5/2) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine and fine roots; few distinct brown or dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; 6 percent pebbles (mixed); gradual smooth boundary.

Bt4—38 to 48 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct brown or dark brown (7.5YR 4/4), strong brown (7.5YR 4/6 and 5/8), and grayish brown (2.5Y 5/2) mottles; moderate medium prismatic structure parting to

moderate fine and medium subangular blocky; firm; common very fine and fine roots; few distinct dark yellowish brown (10YR 4/4) and brown or dark brown (10YR 4/3) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; neutral; 6 percent pebbles (mixed); gradual smooth boundary.

Bt5—48 to 56 inches; clay loam, 50 percent yellowish brown (10YR 5/4) and 50 percent grayish brown (2.5Y 5/2); many fine distinct strong brown (7.5YR 4/6 and 5/8) and brown or dark brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few very fine and fine roots; few distinct brown or dark brown (10YR 4/3) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; slightly alkaline; 6 percent pebbles (mixed); gradual smooth boundary.

BC—56 to 60 inches; clay loam, 50 percent grayish brown (2.5Y 5/2) and 50 percent yellowish brown (10YR 5/4); many fine distinct strong brown (7.5YR 4/6 and 5/8) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few very fine and fine roots; few faint brown (10YR 5/3) and dark brown (10YR 4/3) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions and few fine irregular lime nodules; slightly effervescent; moderately alkaline; 7 percent pebbles.

### Range in Characteristics

*Thickness of the solum:* 45 to 60 inches

*Thickness of the mollic epipedon:* 10 to 16 inches

*Depth to carbonates:* 30 to 60 inches

#### *A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—loam or clay loam

#### *Bt horizon:*

Hue—10YR

Value—3 to 6

Chroma—3 to 6

Texture—loam or clay loam

#### *BC horizon:*

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—2 to 6

Texture—clay loam or loam

**24D—Shelby clay loam, 9 to 14 percent slopes****Composition**

Shelby and similar soils: 100 percent

**Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

**Component Description**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)

*Organic matter content of the surface layer:* About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

**Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

**24D2—Shelby clay loam, 9 to 14 percent slopes, moderately eroded****Composition**

Shelby and similar soils: 100 percent

**Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

**Component Description**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)

*Organic matter content of the surface layer:* About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

**Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

**24E2—Shelby clay loam, 14 to 18 percent slopes, moderately eroded****Composition**

Shelby and similar soils: About 95 percent

Inclusions: About 5 percent

**Setting**

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 14 to 18 percent

**Component Description**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)

*Organic matter content of the surface layer:* About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### ***Inclusions***

- Adair and similar soils
- Severely eroded areas

#### ***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **24E3—Shelby clay loam, 14 to 18 percent slopes, severely eroded**

#### ***Composition***

Shelby and similar soils: About 95 percent  
Inclusions: About 5 percent

#### ***Setting***

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 14 to 18 percent

#### ***Component Description***

*Surface layer texture:* Clay loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Glacial till  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)  
*Organic matter content of the surface layer:* About 1.7 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is

available in the "Soil Properties" section in Part II of this publication.

#### ***Inclusions***

- Adair and similar soils
- Soils that have a thicker surface layer than the Shelby soil

#### ***Major Uses of the Unit***

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **24F2—Shelby clay loam, 18 to 25 percent slopes, moderately eroded**

#### ***Composition***

Shelby and similar soils: 100 percent

#### ***Setting***

*Landform:* Uplands  
*Geomorphic component:* Head slopes, nose slopes, and side slopes  
*Hillslope position:* Backslopes  
*Slope:* 18 to 25 percent

#### ***Component Description***

*Surface layer texture:* Clay loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Glacial till  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)  
*Organic matter content of the surface layer:* About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### ***Major Uses of the Unit***

- Hayland
- Pasture

For general and detailed information concerning

these uses, see Part II of this publication:

- Agronomy section

### **93D2—Shelby-Adair complex, 9 to 14 percent slopes, moderately eroded**

#### ***Composition***

Shelby and similar soils: About 60 percent

Adair and similar soils: About 40 percent

#### ***Setting***

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

#### ***Component Description***

##### **Shelby**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.2 inches (high)

*Organic matter content of the surface layer:* About 2.7 percent (moderate)

##### **Adair**

*Surface layer texture:* Clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Glacial till

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 9.1 inches (high)

*Organic matter content of the surface layer:* About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### ***Major Uses of the Unit***

- Cropland
- Hayland

- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **5025—Strip mines, dumps**

#### ***Component Description***

*Surface layer texture:* Unweathered bedrock

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*General information:* This map unit consists of areas of mines and dumps where bedrock has been removed.

#### ***Major Uses of the Unit***

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

### ***Tuskeego Series***

*Drainage class:* Poorly drained

*Permeability:* Very slow

*Landform:* Stream terraces

*Parent material:* Silty alluvium

*Native vegetation:* Mixed prairie grasses and deciduous trees

*Slope range:* 0 to 2 percent

#### ***Typical Pedon***

Tuskeego silt loam, 0 to 2 percent slopes, 1,980 feet east and 1,490 feet north of the southwest corner of sec. 11, T. 71 N., R. 23 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak fine and medium subangular blocky structure parting to moderate fine granular; friable; common very fine and fine roots; moderately acid; clear smooth boundary.

E1—9 to 15 inches; grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) and light gray or gray (10YR 6/1) dry; few fine distinct yellowish brown (10YR 5/6) mottles; weak thin platy structure parting to weak fine subangular blocky; friable; common fine roots; common distinct dark grayish brown (10YR 4/2) coatings on faces of ped; few fine rounded iron-

manganese concretions; slightly acid; clear smooth boundary.

- E2—15 to 20 inches; grayish brown (2.5Y 5/2) silt loam, light gray (10YR 7/2) dry; common fine prominent yellowish brown (10YR 5/6) mottles; weak thick platy structure parting to weak fine subangular blocky; friable; few fine roots; few distinct very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few grayish brown (10YR 5/2) coatings on faces of peds; slightly acid; clear smooth boundary.
- Btg1—20 to 25 inches; silty clay loam, 60 percent grayish brown (2.5Y 5/2) and 40 percent very dark gray (10YR 3/1); common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few prominent very dark gray (10YR 3/1) clay films (cutans) on faces of peds and few grayish brown (10YR 5/2) coatings in root channels, pores, or both; slightly acid; gradual smooth boundary.
- Btg2—25 to 32 inches; grayish brown (2.5Y 5/2) silty clay; many fine prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; few distinct very dark gray (10YR 3/1) organic coatings on faces of peds and few dark gray (10YR 4/1) clay films (cutans); neutral; gradual smooth boundary.
- Btg3—32 to 40 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine distinct yellowish brown (10YR 5/6) and few prominent strong brown (7.5YR 4/6) mottles; weak fine and medium prismatic structure; firm; few faint grayish brown (10YR 5/2) clay films (cutans) on faces of peds; common fine irregular iron-manganese concretions; neutral; gradual smooth boundary.
- Btg4—40 to 53 inches; light brownish gray (2.5Y 6/2) silty clay loam; many fine and medium prominent yellowish brown (10YR 5/6) and common fine strong brown (7.5YR 4/6) mottles; weak medium prismatic structure; firm; few faint light gray or gray (10YR 6/1) clay films (cutans) on faces of peds; common fine irregular iron-manganese concretions; neutral; gradual smooth boundary.
- Btg5—53 to 60 inches; silty clay loam, 55 percent light brownish gray (2.5Y 6/2) and 45 percent strong brown (7.5YR 5/6); weak medium prismatic structure; friable; very few faint light gray or gray (10YR 6/1) clay films (cutans) on faces of peds; common fine irregular iron-manganese concretions; neutral.

### Range in Characteristics

*Thickness of the solum:* 48 to 60 inches

#### *A horizon:*

Hue—10YR  
Value—3  
Chroma—2 or 3  
Texture—silt loam

#### *E horizon:*

Hue—10YR or 2.5Y  
Value—4 or 5  
Chroma—1 or 2  
Texture—silt loam

#### *Btg horizon:*

Hue—10YR or 2.5Y  
Value—4 to 6  
Chroma—1 or 2  
Texture—silty clay or silty clay loam

## 453—Tuskeego silt loam, 0 to 2 percent slopes

### Composition

Tuskeego and similar soils: About 95 percent  
Inclusions: About 5 percent

### Setting

*Landform:* Stream terraces  
*Slope:* 0 to 2 percent

### Component Description

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Poorly drained  
*Dominant parent material:* Silty alluvium  
*Frequency of flooding:* Rare  
*Water table:* At the surface to 1 foot below the surface  
*Kind of water table:* Apparent  
*Available water capacity to 60 inches or root-limiting layer:* About 10.8 inches (high)  
*Organic matter content of the surface layer:* About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### Inclusions

- Humeston and similar soils

### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### **Vesser Series**

*Drainage class:* Somewhat poorly drained

*Permeability:* Moderate

*Landform:* Alluvial fans, flood plains, and upland drainageways

*Parent material:* Alluvium

*Native vegetation:* Prairie grasses

*Slope range:* 0 to 5 percent

#### **Typical Pedon**

Vesser silt loam, 0 to 2 percent slopes, 1,650 feet south and 1,480 feet west of the northeast corner of sec. 25, T. 72 N., R. 22 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam; 70 percent dark gray (10YR 4/1) dry and 30 percent gray (10YR 5/1) dry; moderate fine granular structure; friable; few coarse, common medium, and many very fine and fine roots; neutral; clear smooth boundary.

A—9 to 14 inches; brown or dark brown (10YR 4/3), very dark gray (10YR 3/1) exterior silt loam; gray (10YR 5/1) dry; moderate very fine and fine granular structure; friable; few coarse, common medium, and many very fine and fine roots; moderately acid; clear smooth boundary.

E1—14 to 19 inches; dark gray (10YR 4/1) silt loam; 70 percent gray (10YR 5/1) dry and 30 percent light gray or gray (10YR 6/1) dry; common fine distinct brown or dark brown (7.5YR 4/4) and dark yellowish brown (10YR 4/6) mottles; moderate medium platy structure parting to moderate thin platy; friable; common medium and many very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few dark grayish brown (10YR 4/2) coatings on faces of peds; common fine rounded iron-manganese concretions; moderately acid; clear smooth boundary.

E2—19 to 26 inches; silt loam, 50 percent dark gray (10YR 4/1) and 50 percent gray (10YR 5/1); 50

percent light gray (10YR 7/1) dry and 50 percent grayish brown (10YR 5/2) dry; many fine distinct dark yellowish brown (10YR 4/6) and brown or dark brown (7.5YR 4/4) mottles; moderate medium platy structure parting to moderate thin platy; friable; few medium and many very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few dark gray (10YR 4/1) coatings on faces of peds; common fine rounded iron-manganese concretions; moderately acid; clear smooth boundary.

E3—26 to 33 inches; gray (10YR 5/1) silt loam; 70 percent light gray (10YR 7/1) dry and 30 percent light brownish gray (10YR 6/2) dry; common fine distinct brown or dark brown (7.5YR 4/4) and dark yellowish brown (10YR 4/6) mottles; moderate thick platy structure parting to moderate medium platy; friable; few medium and many very fine and fine roots; few faint dark grayish brown (10YR 4/2) organic coatings on faces of peds and few light gray (10YR 7/1) coatings; common fine rounded iron-manganese concretions; moderately acid; clear smooth boundary.

Btg1—33 to 40 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6 and 5/8) mottles; moderate medium prismatic structure; friable; few medium and many very fine and fine roots; few distinct very dark gray (10YR 3/1) organic coatings on faces of peds, few dark grayish brown (10YR 4/2) clay films (cutans), and few light gray (10YR 7/1) coatings; common fine rounded iron-manganese concretions; moderately acid; gradual smooth boundary.

Btg2—40 to 47 inches; silty clay loam, 50 percent grayish brown (2.5Y 5/2) and 50 percent gray (10YR 5/1); common fine distinct brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6 and 5/8) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few medium and common very fine and fine roots; few distinct very dark gray (10YR 3/1) organic coatings on faces of peds, few dark grayish brown (10YR 4/2) clay films (cutans), and few light gray (10YR 7/1) coatings; common fine rounded iron-manganese concretions; moderately acid; gradual smooth boundary.

Btg3—47 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6 and 5/8) mottles; moderate medium prismatic

structure parting to moderate fine and medium subangular blocky; firm; common very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct dark grayish brown (2.5Y 4/2) clay films (cutans) on faces of peds; common fine rounded iron-manganese concretions; moderately acid.

#### **Range in Characteristics**

*Thickness of the solum:* Greater than 60 inches

*Thickness of the mollic epipedon:* 10 to 14 inches

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

*E horizon:*

Hue—10YR

Value—3 to 5

Chroma—1 or 2

Texture—silt loam

*Btg horizon:*

Hue—10YR or 2.5Y

Value—3 to 5

Chroma—1 or 2

Texture—silty clay loam

### **51—Vesser silt loam, 0 to 2 percent slopes**

#### **Composition**

Vesser and similar soils: About 90 percent

Inclusions: About 10 percent

#### **Setting**

*Landform:* Flood plains

*Slope:* 0 to 2 percent

#### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Alluvium

*Frequency of flooding:* Occasional

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Apparent

*Available water capacity to 60 inches or root-limiting layer:* About 12.0 inches (high)

*Organic matter content of the surface layer:* About 3.5 percent (moderate)

A typical soil series description with range in

characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### **Inclusions**

- Soils that have a surface layer of loam
- Soils that have a thinner surface layer than the Vesser soil

#### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **51+—Vesser silt loam, 0 to 2 percent slopes, overwash**

#### **Composition**

Vesser and similar soils: About 90 percent

Inclusions: About 10 percent

#### **Setting**

*Landform:* Flood plains

*Slope:* 0 to 2 percent

#### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Alluvium

*Frequency of flooding:* Occasional

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Apparent

*Available water capacity to 60 inches or root-limiting layer:* About 12.0 inches (high)

*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### **Inclusions**

- Soils that have a surface layer of loam



- Soils that have a thinner surface layer than the Vesser soil

### ***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

## **51B—Vesser silt loam, 2 to 5 percent slopes**

### ***Composition***

Vesser and similar soils: About 90 percent  
Inclusions: About 10 percent

### ***Setting***

*Landform:* Alluvial fans

*Geomorphic component:* Base slopes

*Hillslope position:* Footslopes

*Slope:* 2 to 5 percent

### ***Component Description***

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Alluvium

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Apparent

*Available water capacity to 60 inches or root-limiting layer:* About 12.0 inches (high)

*Organic matter content of the surface layer:* About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

### ***Inclusions***

- Humeston and similar soils
- Soils that have more sand than the Vesser soil
- Soils that have a thinner surface layer than the Vesser soil

### ***Major Uses of the Unit***

- Cropland

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

## **51B+—Vesser silt loam, 2 to 5 percent slopes, overwash**

### ***Composition***

Vesser and similar soils: About 90 percent  
Inclusions: About 10 percent

### ***Setting***

*Landform:* Alluvial fans

*Geomorphic component:* Base slopes

*Hillslope position:* Footslopes

*Slope:* 2 to 5 percent

### ***Component Description***

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Alluvium

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Apparent

*Available water capacity to 60 inches or root-limiting layer:* About 12.0 inches (high)

*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

### ***Inclusions***

- Humeston and similar soils

### ***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

## **Wabash Series**

*Drainage class:* Poorly drained

*Permeability:* Very slow

*Landform:* Flood plains

*Parent material:* Silty alluvium

*Native vegetation:* Prairie grasses and trees

*Slope range:* 0 to 2 percent

### **Typical Pedon**

Wabash silty clay, 0 to 2 percent slopes, 475 feet north and 600 feet west of the southeast corner of sec. 9, T. 71 N., R. 22 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay, dark gray (N 4/0) dry; moderate very fine and fine granular structure; firm; common medium and many very fine and fine roots; neutral; clear smooth boundary.

A1—8 to 18 inches; black (N 2/0) silty clay, dark gray (N 4/0) dry; moderate very fine and fine subangular blocky structure; very firm; common medium and many very fine and fine roots; few fine threads and wormcasts; neutral; gradual smooth boundary.

A2—18 to 24 inches; black (N 2/0) silty clay, dark gray (N 4/0) dry; moderate fine prismatic structure parting to moderate fine and medium subangular blocky; very firm; common medium and many very fine and fine roots; common fine threads and wormcasts; neutral; gradual smooth boundary.

A3—24 to 32 inches; black (10YR 2/1) silty clay, gray (N 5/0) dry; moderate fine and medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common medium and many very fine and fine roots; few fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

Bg1—32 to 42 inches; very dark gray (10YR 3/1) silty clay; common fine distinct grayish brown (2.5Y 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; few medium and many very fine and fine roots; few very dark gray (10YR 3/1) organic coatings on faces of peds and in root channels, pores, or both; few black (10YR 2/1) pressure faces; common fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

Bg2—42 to 52 inches; dark gray (5Y 4/1) silty clay loam; common fine distinct grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky;

firm; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; very dark gray (10YR 3/1 and 5Y 3/1) pressure faces on faces of peds; neutral; gradual smooth boundary.

BCg—52 to 60 inches; gray (5Y 5/1) silty clay loam; common fine distinct grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few very fine and fine roots; few very dark gray (10YR 3/1) organic coatings in root channels, pores, or both; few distinct dark gray (5Y 4/1) pressure faces; few fine rounded iron-manganese concretions; neutral.

### **Range in Characteristics**

*Thickness of the solum:* 40 to 60 inches

*Thickness of the mollic epipedon:* 24 to 45 inches

*A horizon:*

Hue—10YR, 2.5Y, or neutral

Value—2 or 3

Chroma—0 or 1

Texture—silty clay or silty clay loam

*Bg horizon:*

Hue—10YR to 5Y or neutral

Value—3 to 5

Chroma—0 or 1

Texture—silty clay or silty clay loam

*BCg horizon:*

Hue—2.5Y, 5Y, or neutral

Value—4 or 5

Chroma—0 to 2

Texture—silty clay or silty clay loam

## **172—Wabash silty clay, 0 to 2 percent slopes**

### **Composition**

Wabash and similar soils: About 95 percent

Inclusions: About 5 percent

### **Setting**

*Landform:* Flood plains

*Slope:* 0 to 2 percent

### **Component Description**

*Surface layer texture:* Silty clay

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Poorly drained

*Dominant parent material:* Silty alluvium

*Frequency of flooding:* Occasional

*Water table:* At the surface to 1 foot below the surface

*Kind of water table:* Apparent

*Available water capacity to 60 inches or root-limiting layer:* About 7.0 inches (moderate)

*Organic matter content of the surface layer:* About 4.5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### ***Inclusions***

- Chequest and similar soils

### ***Major Uses of the Unit***

- Cropland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### ***Weller Series***

*Drainage class:* Moderately well drained

*Permeability:* Slow

*Landform:* Uplands

*Parent material:* Loess

*Native vegetation:* Deciduous trees

*Slope range:* 2 to 14 percent

### ***Typical Pedon***

Weller silt loam, 2 to 5 percent slopes, 400 feet south and 620 feet east of the northwest corner of sec. 9, T. 72 N., R. 20 W.

Ap—0 to 7 inches; silt loam, 65 percent dark grayish brown (10YR 4/2) and 35 percent brown (10YR 5/3); light gray (10YR 7/2) dry; weak thin platy structure; friable; few prominent dark reddish brown (5YR 3/2) oxide coatings; moderately acid; abrupt smooth boundary.

E—7 to 12 inches; brown (10YR 5/3), grayish brown (10YR 5/2) exterior, yellowish brown (10YR 5/4) crushed silt loam; very pale brown (10YR 7/3) dry; moderate medium platy structure; friable; few grayish brown (10YR 5/2) discontinuous coatings and dark reddish brown (5YR 3/2) oxide coatings; very strongly acid; clear smooth boundary.

BE—12 to 18 inches; yellowish brown (10YR 5/4)

silty clay loam; moderate fine subangular blocky structure parting to moderate fine angular blocky; firm; light gray (10YR 7/1) continuous coatings on faces of peds, clay films (cutans), and few very fine soft dark reddish brown (5YR 3/2) oxide coatings; very strongly acid; abrupt smooth boundary.

Bt1—18 to 25 inches; yellowish brown (10YR 5/4) silty clay; few fine distinct grayish brown (2.5Y 5/2) mottles; moderate very fine and fine subangular blocky structure parting to moderate very fine and fine angular blocky; very firm; very few prominent dark reddish brown (5YR 3/2) oxide coatings; very strongly acid; gradual smooth boundary.

Bt2—25 to 34 inches; yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) silty clay; few fine faint grayish brown (2.5Y 5/2) and distinct brown or dark brown (7.5YR 4/4) mottles; weak very fine subangular blocky structure; very firm; grayish brown (10YR 5/2) discontinuous organic coatings on faces of peds, continuous clay films (cutans), and few dark reddish brown (5YR 2/2) oxide coatings; very strongly acid; gradual smooth boundary.

Bt3—34 to 43 inches; grayish brown (2.5Y 5/2) silty clay; weak fine and medium subangular blocky structure; firm; continuous clay films (cutans) and few prominent dark reddish brown (5YR 2/2) oxide coatings; strongly acid; gradual smooth boundary.

Bt4—43 to 55 inches; yellowish brown (10YR 5/6) silty clay loam; few fine prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; firm; few faint brown (10YR 5/3) coatings on faces of peds, continuous clay films (cutans), very few light gray (10YR 7/2) discontinuous coatings on vertical faces of peds, and prominent reddish brown (5YR 4/4) oxide coatings; strongly acid; diffuse smooth boundary.

Bt5—55 to 60 inches; grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) silty clay loam; firm; discontinuous clay films (cutans) in root channels, pores, or both; moderately acid.

### ***Range in Characteristics***

*Thickness of the solum:* Greater than 48 inches

*A horizon:*

Hue—10YR

Value—3 or 4

Chroma—1 or 2

Texture—silt loam or silty clay loam

*E horizon:*

Hue—10YR  
 Value—4 or 5  
 Chroma—2 or 3  
 Texture—silt loam

*Bt horizon:*

Hue—10YR or 2.5Y  
 Value—4 or 5  
 Chroma—2 to 6  
 Texture—silty clay or silty clay loam

**132B—Weller silt loam, 2 to 5 percent slopes****Composition**

Weller and similar soils: 100 percent

**Setting**

*Landform:* Uplands  
*Geomorphic component:* Interfluves  
*Hillslope position:* Shoulders and summits  
*Slope:* 2 to 5 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Loess  
*Flooding:* None  
*Depth to the water table:* 2 to 4 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 10.6 inches (high)  
*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

**Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

- Forest Land section

**132C—Weller silt loam, 5 to 9 percent slopes****Composition**

Weller and similar soils: 100 percent

**Setting**

*Landform:* Uplands  
*Geomorphic component:* Interfluves, head slopes, nose slopes, and side slopes  
*Hillslope position:* Summits, shoulders, and backslopes  
*Slope:* 5 to 9 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Loess  
*Flooding:* None  
*Depth to the water table:* 2 to 4 feet  
*Kind of water table:* Perched  
*Available water capacity to 60 inches or root-limiting layer:* About 10.6 inches (high)  
*Organic matter content of the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

**Major Uses of the Unit**

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

**132C2—Weller silty clay loam, 5 to 9 percent slopes, moderately eroded****Composition**

Weller and similar soils: 100 percent

### Setting

*Landform:* Uplands

*Geomorphic component:* Interfluves, head slopes, nose slopes, and side slopes

*Hillslope position:* Summits, shoulders, and backslopes

*Slope:* 5 to 9 percent

### Component Description

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Loess

*Flooding:* None

*Depth to the water table:* 2 to 4 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 10.4 inches (high)

*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

## 132D2—Weller silty clay loam, 9 to 14 percent slopes, moderately eroded

### Composition

Weller and similar soils: 100 percent

### Setting

*Landform:* Uplands

*Geomorphic component:* Head slopes, nose slopes, and side slopes

*Hillslope position:* Backslopes

*Slope:* 9 to 14 percent

### Component Description

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Loess

*Flooding:* None

*Depth to the water table:* 2 to 4 feet

*Kind of water table:* Perched

*Available water capacity to 60 inches or root-limiting layer:* About 10.4 inches (high)

*Organic matter content of the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

### Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

### Zook Series

*Drainage class:* Poorly drained

*Permeability:* Slow

*Landform:* Flood plains and upland drainageways

*Parent material:* Silty alluvium

*Native vegetation:* Prairie grasses

*Slope range:* 0 to 5 percent

### Typical Pedon

Zook silty clay loam, 0 to 2 percent slopes, 1,390 feet north and 1,030 feet west of the southeast corner of sec. 15, T. 72 N., R. 23 W.

Ap—0 to 7 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; cloddy parting to moderate fine granular structure; friable; common medium and many very fine and fine roots; neutral; clear smooth boundary.

A1—7 to 14 inches; black (N 2/0) silty clay, very dark gray (10YR 3/1) dry; moderate very fine and fine granular structure; firm; common medium and many very fine and fine roots; neutral; clear smooth boundary.

A2—14 to 21 inches; black (N 2/0) silty clay, very dark gray (10YR 3/1) dry; moderate very fine and

fine subangular blocky structure; firm; few medium and many very fine and fine roots; few black (N 2/0) pressure faces on faces of peds; neutral; gradual smooth boundary.

A3—21 to 29 inches; black (N 2/0) silty clay, very dark gray (10YR 3/1) dry; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; few black (N 2/0) pressure faces on faces of peds; neutral; gradual smooth boundary.

A4—29 to 37 inches; silty clay, 50 percent black (N 2/0) and 50 percent black (10YR 2/1); very dark gray (10YR 3/1) dry; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; common very fine and fine roots; few black (10YR 2/1) pressure faces on faces of peds; few fine rounded iron-manganese concretions; neutral; clear smooth boundary.

Bg1—37 to 45 inches; silty clay, 50 percent black (10YR 2/1) and 50 percent very dark gray (10YR 3/1); few fine distinct brown or dark brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine and fine roots; few black (N 2/0) organic coatings and few black (10YR 2/1) pressure faces on faces of peds; few fine rounded iron-manganese concretions; neutral; clear smooth boundary.

Bg2—45 to 55 inches; silty clay, 50 percent very dark gray (10YR 3/1) and 50 percent dark gray (5Y 4/1); common fine distinct brown or dark brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few very fine and fine roots; few black (10YR 2/1 and N 2/0) organic coatings on faces of peds; common fine rounded iron-manganese concretions; neutral; gradual smooth boundary.

BCg—55 to 60 inches; silty clay, 50 percent very dark gray (10YR 3/1) and 50 percent dark gray (5Y 4/1); common fine distinct brown or dark brown (7.5YR 4/4) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few very fine and fine roots; few black (10YR 2/1 and N 2/0) organic coatings on faces of peds; common fine rounded iron-manganese concretions; neutral.

#### Range in Characteristics

*Thickness of the solum:* 36 to 60 inches

*Thickness of the mollic epipedon:* 30 to 50 inches

#### A horizon:

Hue—10YR or neutral

Value—2 or 3

Chroma—0 or 1

Texture—silty clay loam or silt loam

#### Bg horizon:

Hue—10YR to 5Y

Value—2 to 5

Chroma—1

Texture—silty clay or silty clay loam

#### BCg horizon:

Hue—10YR to 5Y

Value—2 to 5

Chroma—1

Texture—silty clay or silty clay loam

### 13B—Zook-Olmitz-Vesser complex, 0 to 5 percent slopes

#### Composition

Zook and similar soils: About 45 percent

Olmitz and similar soils: About 30 percent

Vesser and similar soils: About 20 percent

Inclusions: About 5 percent

#### Setting

*Landform:* Upland drainageways

*Geomorphic component:* Base slopes

*Hillslope position:* Toeslopes and footslopes

*Slope:* Zook—0 to 5 percent; Olmitz—2 to 5 percent;

Vesser—2 to 5 percent

#### Component Description

##### Zook

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Poorly drained

*Dominant parent material:* Local alluvium

*Flooding:* None

*Water table:* At the surface to 1 foot below the surface

*Kind of water table:* Apparent

*Available water capacity to 60 inches or root-limiting layer:* About 7.9 inches (moderate)

*Organic matter content of the surface layer:* About 6 percent (high)

##### Olmitz

*Surface layer texture:* Loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Dominant parent material:* Local alluvium

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 10.7 inches (high)

*Organic matter content of the surface layer:* About 3.5 percent (moderate)

#### **Vesser**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Local alluvium

*Flooding:* None

*Depth to the water table:* 1 to 3 feet

*Kind of water table:* Apparent

*Available water capacity to 60 inches or root-limiting layer:* About 12.0 inches (high)

*Organic matter content of the surface layer:* About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### **Inclusions**

- Nodaway and similar soils
- Ackmore and similar soils

#### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **54—Zook silty clay loam, 0 to 2 percent slopes**

#### **Composition**

Zook and similar soils: About 95 percent  
Inclusions: About 5 percent

#### **Setting**

*Landform:* Flood plains  
*Slope:* 0 to 2 percent

#### **Component Description**

*Surface layer texture:* Silty clay loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Poorly drained  
*Dominant parent material:* Silty alluvium  
*Frequency of flooding:* Occasional

*Water table:* At the surface to 1 foot below the surface

*Kind of water table:* Apparent

*Available water capacity to 60 inches or root-limiting layer:* About 8.9 inches (moderate)

*Organic matter content of the surface layer:* About 6 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### **Inclusions**

- Chequest and similar soils
- Soils that have more sand than the Zook soil
- Soils that have a thinner surface layer than the Zook soil

#### **Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **54+—Zook silt loam, 0 to 2 percent slopes, overwash**

#### **Composition**

Zook and similar soils: About 95 percent  
Inclusions: About 5 percent

#### **Setting**

*Landform:* Flood plains  
*Slope:* 0 to 2 percent

#### **Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Poorly drained  
*Dominant parent material:* Silty alluvium  
*Frequency of flooding:* Occasional  
*Water table:* At the surface to 1 foot below the surface  
*Kind of water table:* Apparent  
*Available water capacity to 60 inches or root-limiting layer:* About 9.3 inches (high)  
*Organic matter content of the surface layer:* About 3 percent (moderate)

A typical soil series description with range in

characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### ***Inclusions***

- Chequest and similar soils
- Soils that have more sand throughout than the Zook soil

#### ***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

### **54B—Zook silty clay loam, 2 to 5 percent slopes**

#### ***Composition***

Zook and similar soils: About 90 percent

Inclusions: About 10 percent

#### ***Setting***

*Landform:* Upland drainageways

*Geomorphic component:* Base slopes

*Hillslope position:* Toeslopes and footslopes

*Slope:* 2 to 5 percent

#### ***Component Description***

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Poorly drained

*Dominant parent material:* Silty alluvium

*Flooding:* None

*Water table:* At the surface to 1 foot below the surface

*Kind of water table:* Apparent

*Available water capacity to 60 inches or root-limiting layer:* About 7.9 inches (moderate)

*Organic matter content of the surface layer:* About 6 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

#### ***Inclusions***

- Soils that have more sand than the Zook soil
- Soils that have a thinner surface layer than the Zook soil

#### ***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section



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# Glossary

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**Ablation till.** Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

**Aeration, soil.** The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

**Aggregate, soil.** Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

**Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.

**Aquic conditions.** Current soil wetness characterized by saturation, reduction, and redoximorphic features.

**Area reclaim** (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

**Argillic horizon.** A subsoil horizon characterized by an accumulation of illuvial clay.

**Aspect.** The direction in which a slope faces.

**Association, soil.** A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

**Available water capacity (available moisture capacity).** The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low .....	0 to 3
Low .....	3 to 6
Moderate .....	6 to 9
High .....	9 to 12
Very high .....	more than 12

**Backslope.** The geomorphic component that forms

the steepest inclined surface and principal element of many hillslopes (fig. 7). Backslopes in profile are commonly steep and linear and descend to a footslope. In terms of gradational process, backslopes are erosional forms produced mainly by mass wasting and running water.

**Basal till.** Compact glacial till deposited beneath the ice.

**Base saturation.** The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

**Base slope.** A geomorphic component of hills. It consists of a concave surface at the bottom of hillslopes that is underlain by colluvial and slope-wash materials or forms a colluvial apron or wedge; a three-dimensional analog of a footslope. Distal base slope sediments commonly grade into, interfinger with, or are buried by alluvial fills.

**Beach deposits.** Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a postglacial or glacial lake.

**Bedding planes.** Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Bedrock-controlled topography.** A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

**Bench terrace.** A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

**Bisequum.** Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

**Blowout.** A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor

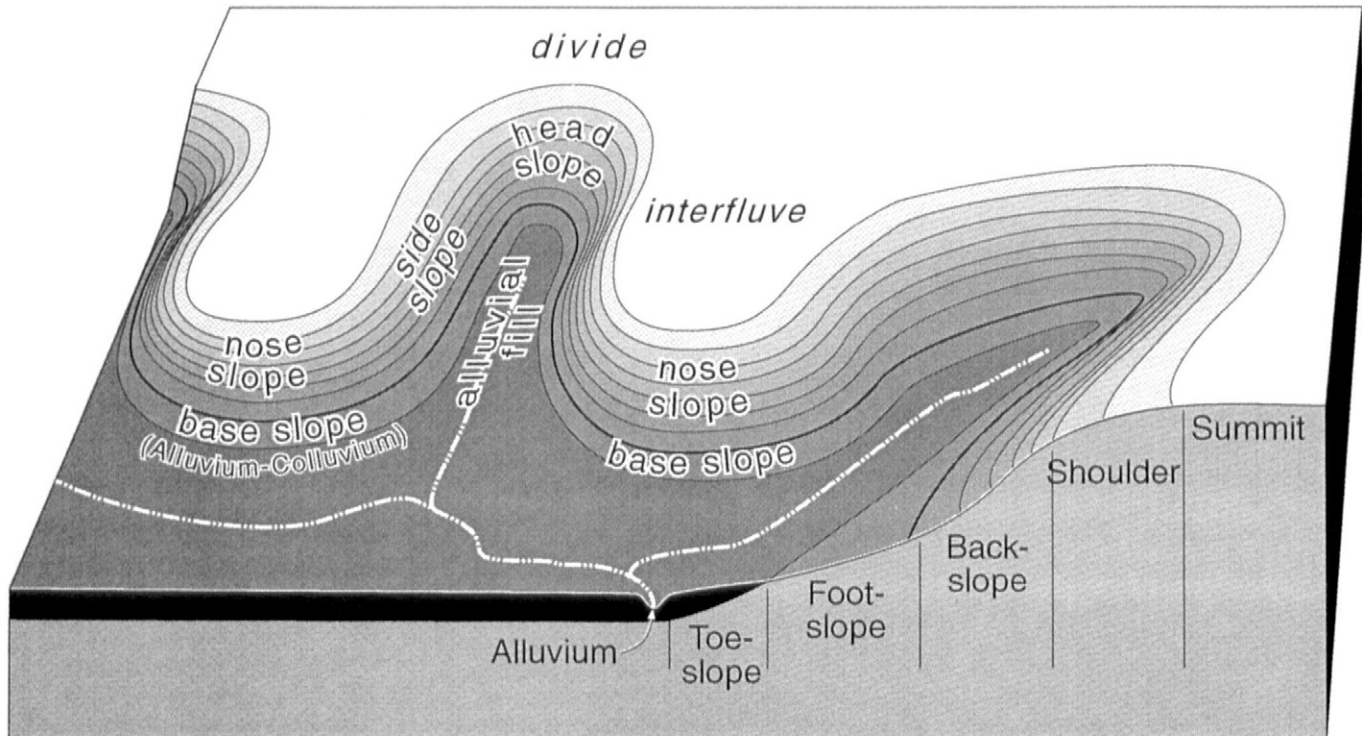


Figure 7.—Landscape relationship of geomorphic components and hillslope positions (modified after Ruhe and Walker, 1968).

formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

**Boulders.** Rock fragments larger than 2 feet (60 centimeters) in diameter.

**Brush management.** Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

**Calcareous soil.** A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

**California bearing ratio (CBR).** The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

**Canopy.** The leafy crown of trees or shrubs. (See Crown.)

**Capillary water.** Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

**Catena.** A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

**Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

**Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

**Catsteps.** Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

**Channery soil.** A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

**Chemical treatment.** Control of unwanted vegetation through the use of chemicals.

**Chiseling.** Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface.

**Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

**Clay depletions.** Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

**Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

**Climax plant community.** The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

**Coarse textured soil.** Sand or loamy sand.

**Cobble (or cobblestone).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

**Cobbly soil material.** Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

**Colluvium.** Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

**Complex slope.** Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

**Complex, soil.** A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

**Compressible** (in tables). Excessive decrease in volume of soft soil under load.

**Concretions.** Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is

unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

**Conservation cropping system.** Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

**Conservation tillage.** Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the surface after planting in order to reduce the hazard of water erosion; in areas where wind erosion is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or its equivalent during the critical erosion period.

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

*Loose.*—Noncoherent when dry or moist; does not hold together in a mass.

*Friable.*—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

*Firm.*—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

*Plastic.*—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

*Sticky.*—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

*Hard.*—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

*Soft.*—When dry, breaks into powder or individual grains under very slight pressure.

*Cemented.*—Hard; little affected by moistening.

**Contour stripcropping (or contour farming).**

Growing crops in strips that follow the contour.

Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

**Coprogenous earth (sedimentary peat).** Fecal material deposited in water by aquatic organisms.

**Corrosive.** High risk of corrosion to uncoated steel or deterioration of concrete.

**Cover crop.** A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

**Cropping system.** Growing crops according to a planned system of rotation and management practices.

**Crop residue management.** Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

**Cross-slope farming.** Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

**Crown.** The upper part of a tree or shrub, including the living branches and their foliage.

**Cutbanks cave** (in tables). The walls of excavations tend to cave in or slough.

**Delta.** A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

**Dense layer** (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

**Depth, soil.** Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

**Depth to rock** (in tables). Bedrock is too near the surface for the specified use.

**Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

**Divide.** (a) The line of separation, or (b) the summit area, or narrow tract of higher ground that constitutes the watershed boundary between two adjacent drainage basins; it divides the surface waters that flow naturally in one direction from those that flow in the opposite direction.

**Drainage class (natural).** Refers to the frequency and duration of periods of saturation or partial

saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

*Excessively drained.*—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

*Somewhat excessively drained.*—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

*Well drained.*—These soils have an intermediate or high water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

*Moderately well drained.*—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of most field crops are affected. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

*Somewhat poorly drained.*—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted under natural conditions. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

*Poorly drained.*—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poor drainage is caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

*Very poorly drained.*—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except for rice) under natural conditions.

**Drainage, surface.** Runoff, or surface flow of water, from an area.

**Drumlin.** A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

**Duff.** A generally firm organic layer on the surface of

mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

**Eluviation.** The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

**Endosaturation.** A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

**Eolian deposits.** Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

**Ephemeral stream.** A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

**Episaturation.** A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

**Erosion.** The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

*Erosion* (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

*Erosion* (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

**Erosion pavement.** A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

**Escarpment.** A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

**Esker.** A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than 1 mile to more than 100 miles in length and from 10 to 100 feet in height.

**Excess fines** (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

**Excess lime** (in tables). Excess carbonates in the soil that restrict the growth of some plants.

**Excess salts** (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

**Fan terrace.** A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

**Fast intake** (in tables). The rapid movement of water into the soil.

**Fertility, soil.** The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

**Fibric soil material (peat).** The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

**Field moisture capacity.** The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

**Fine textured soil.** Sandy clay, silty clay, or clay.

**Firebreak.** An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of fire fighters and equipment. Designated roads also serve as firebreaks.

**First bottom.** The normal flood plain of a stream, subject to frequent or occasional flooding.

**Flaggy soil material.** Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

**Flagstone.** A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

**Flood plain.** A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is generally a constructional landform consisting of sediment deposited during overflow and lateral migration of the stream.

**Footslope.** The geomorphic component that forms

the inner, gently inclined surface at the base of a hillslope. The surface is dominantly concave. In terms of gradational processes, a footslope is a transition zone between an upslope site of erosion (backslope) and a downslope site of deposition (toeslope).

**Forb.** Any herbaceous plant not a grass or a sedge.

**Forest cover.** All trees and other woody plants (underbrush) covering the ground in a forest.

**Forest type.** A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

**Fragile** (in tables). A soil that is easily damaged by use or disturbance.

**Fragipan.** A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon and horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

**Frost action** (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

**Genesis, soil.** The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

**Geomorphology.** The science that treats the general configuration of the earth's surface; specifically the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and the history of geologic changes as recorded by these surface features. The term is especially applied to the genetic interpretation of landforms.

**Glacial drift.** Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

**Glacial outwash.** Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

**Glaciofluvial deposits.** Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

**Glaciolacustrine deposits.** Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial

meltwater. Many deposits are interbedded or laminated.

**Gleyed soil.** Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

**Graded stripcropping.** Growing crops in strips that grade toward a protected waterway.

**Grassed waterway.** A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

**Gravel.** Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

**Gravelly soil material.** Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

**Green manure crop** (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

**Ground water.** Water filling all the unblocked pores of underlying material below the water table.

**Gully.** A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

**Hard bedrock.** Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

**Head slope.** The concave surface at the head of a drainageway where the flow of water converges downward toward the center and contour lines form concave curves.

**Hemic soil material (mucky peat).** Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

**High-chroma zones.** Zones having chroma of 3 or more. Typical color in areas of iron concentrations.

**High-residue crops.** Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.



**Hill.** A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 6 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:

*O horizon.*—An organic layer of fresh and decaying plant residue.

*A horizon.*—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

*E horizon.*—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

*B horizon.*—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

*C horizon.*—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

*Cr horizon.*—Soft, consolidated bedrock beneath the soil.

*R layer.*—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

**Humus.** The well decomposed, more or less stable part of the organic matter in mineral soils.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the

inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

**Ice-walled lake plain.** A relict surface marking the floor of an extinct lake basin that was formed on solid ground and surrounded by stagnant ice in a stable or unstable superglacial environment on stagnation moraines. As the ice melted the lake plain became perched above the adjacent landscape. The lake plain is well sorted, generally fine textured, stratified deposits.

**Igneous rock.** Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

**Illuviation.** The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

**Impervious soil.** A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

**Infiltration.** The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

**Infiltration capacity.** The maximum rate at which water can infiltrate into a soil under a given set of conditions.

**Infiltration rate.** The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

**Intake rate.** The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not

a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2 .....	very low
0.2 to 0.4 .....	low
0.4 to 0.75 .....	moderately low
0.75 to 1.25 .....	moderate
1.25 to 1.75 .....	moderately high
1.75 to 2.5 .....	high
More than 2.5 .....	very high

- Interfluve.** A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.
- Intermittent stream.** A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.
- Iron concentrations.** High-chroma zones having a high content of iron and manganese oxide because of chemical oxidation and accumulation, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic concentration.
- Iron depletions.** Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.
- Irrigation.** Application of water to soils to assist in production of crops. Methods of irrigation are:  
*Basin.*—Water is applied rapidly to nearly level plains surrounded by levees or dikes.  
*Border.*—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.  
*Controlled flooding.*—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.  
*Corrugation.*—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.  
*Drip (or trickle).*—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.  
*Furrow.*—Water is applied in small ditches made

by cultivation implements. Furrows are used for tree and row crops.

*Sprinkler.*—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

*Subirrigation.*—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

*Wild flooding.*—Water, released at high points, is allowed to flow onto an area without controlled distribution.

- Kame.** A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.
- Kame moraine.** An end moraine that contains numerous kames. A group of kames along the front of a stagnant glacier, commonly comprising the slumped remnants of a formerly continuous outwash plain built up over the foot of rapidly wasting or stagnant ice.
- Karst (topography).** The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.
- Knoll.** A small, low, rounded hill rising above adjacent landforms.
- Lacustrine deposit.** Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.
- Lake bed.** The bottom of a lake; a lake basin.
- Lake plain.** A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.
- Lakeshore.** A narrow strip of land in contact with or bordering a lake; especially the beach of a lake.
- Lake terrace.** A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.
- Landslide.** The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.
- Large stones (in tables).** Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.
- Leaching.** The removal of soluble material from soil or other material by percolating water.
- Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state.
- Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

**Loess.** Fine grained material, dominantly of silt-sized particles, deposited by the wind.

**Low-chroma zones.** Zones having chroma of 2 or less. Typical color in areas of iron depletions.

**Low-residue crops.** Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

**Low strength.** The soil is not strong enough to support loads.

**Marl.** An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

**Masses.** Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

**Mechanical treatment.** Use of mechanical equipment for seeding, brush management, and other management practices.

**Medium textured soil.** Very fine sandy loam, loam, silt loam, or silt.

**Metamorphic rock.** Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

**Mineral soil.** Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

**Minimum tillage.** Only the tillage essential to crop production and prevention of soil damage.

**Miscellaneous area.** An area that has little or no natural soil and supports little or no vegetation.

**Moderately coarse textured soil.** Coarse sandy loam, sandy loam, or fine sandy loam.

**Moderately fine textured soil.** Clay loam, sandy clay loam, or silty clay loam.

**Mollic epipedon.** A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

**Moraine.** An accumulation of glacial drift in a topographic landform resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

**Morphology, soil.** The physical makeup of the soil,

including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

**Mottling, soil.** Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

**Muck.** Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

**Mudstone.** Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

**Munsell notation.** A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

**Neutral soil.** A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

**Nodules.** Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

**Nose slope.** The projecting end of an interfluvium, where contour lines connecting the opposing side slopes form convex curves around the projecting end and lines perpendicular to the contours diverge downward. Overland flow of water is divergent.

**Nutrient, plant.** Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

**Organic matter.** Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low .....	less than 0.5 percent
Low .....	0.5 to 1.0 percent
Moderately low .....	1.0 to 2.0 percent

Moderate .....	2.0 to 4.0 percent
High .....	4.0 to 8.0 percent
Very high .....	more than 8.0 percent

**Outwash plain.** An extensive area of glaciofluvial material that was deposited by meltwater streams.

**Parent material.** The unconsolidated organic and mineral material in which soil forms.

**Parts per million (ppm).** The concentration of a substance in the soil, such as phosphorus or potassium, in one million parts of air-dried soil on a weight per weight basis.

**Peat.** Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

**Ped.** An individual natural soil aggregate, such as a granule, a prism, or a block.

**Pediment.** A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

**Pedon.** The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

**Percolation.** The movement of water through the soil.

**Percs slowly** (in tables). The slow movement of water through the soil adversely affects the specified use.

**Permeability.** The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Extremely slow .....	less than 0.01 inch
Very slow .....	0.01 to 0.06 inch
Slow .....	0.06 to 0.2 inch
Moderately slow .....	0.2 to 0.6 inch
Moderate .....	0.6 inch to 2.0 inches
Moderately rapid .....	2.0 to 6.0 inches
Rapid .....	6.0 to 20 inches
Very rapid .....	more than 20 inches

**Phase, soil.** A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

**Phosphorus.** The amount of phosphorus available to plants at a depth of 30 to 42 inches is expressed

in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available phosphorus are:

Very low .....	less than 7.5 ppm
Low .....	7.5 to 13.0 ppm
Medium .....	13.0 to 22.5 ppm
High .....	more than 22.5 ppm

**pH value.** A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

**Piping** (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

**Pitted outwash plain.** An outwash plain marked by many irregular depressions, such as kettles, shallow pits, and potholes, which formed by melting of incorporated ice masses; many are found in Wisconsin and Minnesota.

**Plasticity index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

**Plastic limit.** The moisture content at which a soil changes from semisolid to plastic.

**Plateau.** An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

**Plowpan.** A compacted layer formed in the soil directly below the plowed layer.

**Ponding.** Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

**Poor filter** (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

**Poorly graded.** Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

**Poor outlets** (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

**Potassium.** The amount of potassium available to plants at a depth of 12 to 24 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available potassium are:

Very low .....	less than 50 ppm
Low .....	50 to 79 ppm
Medium .....	79 to 125 ppm
High .....	more than 125 ppm

**Potential native plant community.** See Climax plant community.

**Potential rooting depth (effective rooting depth).** Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

**Prescribed burning.** Burning an area under conditions of weather and soil moisture and at the time of day that will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

**Productivity, soil.** The capability of a soil for producing a specified plant or sequence of plants under specific management.

**Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.

**Reaction, soil.** A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid .....	less than 4.5
Very strongly acid .....	4.5 to 5.0
Strongly acid .....	5.1 to 5.5
Moderately acid .....	5.6 to 6.0
Slightly acid .....	6.1 to 6.5
Neutral .....	6.6 to 7.3
Slightly alkaline .....	7.4 to 7.8
Moderately alkaline .....	7.9 to 8.4
Strongly alkaline .....	8.5 to 9.0
Very strongly alkaline .....	9.1 and higher

**Redoximorphic concentrations.** Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

**Redoximorphic depletions.** Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

**Redoximorphic features.** Redoximorphic concentrations, redoximorphic depletions,

reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

**Reduced matrix.** A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

**Regolith.** The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

**Relief.** The elevations or inequalities of a land surface, considered collectively.

**Residuum (residual soil material).** Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

**Rill.** A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

**Road cut.** A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

**Rock fragments.** Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

**Rooting depth (in tables).** Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

**Root zone.** The part of the soil that can be penetrated by plant roots.

**Runoff.** The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

**Saline soil.** A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Sandstone.** Sedimentary rock containing dominantly sand-sized particles.

- Sapric soil material (muck).** The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.
- Saprolite.** Unconsolidated residual material underlying the soil and grading to hard bedrock below.
- Saturation.** Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.
- Scarification.** The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.
- Second bottom.** The first terrace above the normal flood plain (or first bottom) of a river.
- Sedimentary rock.** Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.
- Seepage** (in tables). The movement of water through the soil. Seepage adversely affects the specified use.
- Sequum.** A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)
- Series, soil.** A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.
- Shale.** Sedimentary rock formed by the hardening of a clay deposit.
- Sheet erosion.** The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.
- Shoulder.** The hillslope position that forms the uppermost inclined surface near the top of a hillslope. It comprises the transition zone from backslope to summit. The surface is dominantly convex in profile and erosional in origin.
- Shrink-swell** (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.
- Side slope.** The slope bounding a drainageway and lying between the drainageway and the adjacent interfluvium. It is generally linear along the slope width, and overland flow is parallel down the slope.
- Silica.** A combination of silicon and oxygen. The mineral form is called quartz.
- Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.
- Siltstone.** Sedimentary rock made up of dominantly silt-sized particles.
- Similar soils.** Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.
- Sinkhole.** A depression in the landscape where limestone has been dissolved.
- Site index.** A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.
- Slickensides.** Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.
- Slippage** (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.
- Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.
- Slope** (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.
- Sloughed till.** Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.
- Slow intake** (in tables). The slow movement of water into the soil.
- Slow refill** (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

**Small stones** (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

**Soft bedrock.** Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

**Soil.** A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

**Soil separates.** Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand .....	2.0 to 1.0
Coarse sand .....	1.0 to 0.5
Medium sand .....	0.5 to 0.25
Fine sand .....	0.25 to 0.10
Very fine sand .....	0.10 to 0.05
Silt .....	0.05 to 0.002
Clay .....	less than 0.002

**Solum.** The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

**Stagnation moraine.** A body of drift released by the melting of a glacier that ceased flowing. Commonly but not always occurs near ice margins; composed of till, ice-contact stratified drift, and small areas of glacial lake sediment. Typical landforms are knob-and-kettle topography, locally including ice-walled lake plains.

**Stone line.** A concentration of rock fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

**Stones.** Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

**Stony.** Refers to a soil containing stones in numbers that interfere with or prevent tillage.

**Stripcropping.** Growing crops in a systematic

arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

**Structure, soil.** The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Stubble mulch.** Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

**Subsoil.** Technically, the B horizon; roughly, the part of the solum below plow depth.

**Subsoiling.** Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that restricts roots.

**Substratum.** The part of the soil below the solum.

**Subsurface layer.** Any surface soil horizon (A, E, AB, or EB) below the surface layer.

**Summit.** The topographically highest position of a hillslope profile and exhibiting a nearly level surface. A general term for the top, or highest level, of a landform such as a hill, mountain, or tableland. It usually refers to a high interfluvial area of gentler slope that is flanked by steeper hillslopes, for example, mountain fronts or tableland escarpments.

**Surface layer.** The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

**Surface soil.** The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

**Swale.** A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine due to uneven glacial deposition.

**Taxadjuncts.** Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

- Terminal moraine.** A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive, arcuate ridge or complex of ridges underlain by till and other types of drift.
- Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.
- Terrace** (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.
- Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."
- Thin layer** (in tables). Otherwise suitable soil material too thin for the specified use.
- Till.** Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.
- Till plain.** An extensive area of nearly level to undulating or gently sloping soils that are underlain by till or consist of till. Slopes are 0 to 6 percent.
- Tilth, soil.** The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.
- Toeslope.** The outermost inclined surface at the base of a hill. Toeslopes are commonly gentle and linear in profile.
- Topsoil.** The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.
- Toxicity** (in tables). Excessive amount of toxic substances, such as salts, that severely hinder establishment of vegetation or severely restrict plant growth.
- Trace elements.** Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.
- Unstable fill** (in tables). Risk of caving or sloughing on banks of fill material.
- Upland** (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.
- Valley fill.** In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.
- Variation.** Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.
- Varve.** A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.
- Water bars.** Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.
- Weathering.** All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.
- Well graded.** Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.
- Wilting point (or permanent wilting point).** The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.
- Windthrow.** The uprooting and tipping over of trees by the wind.