

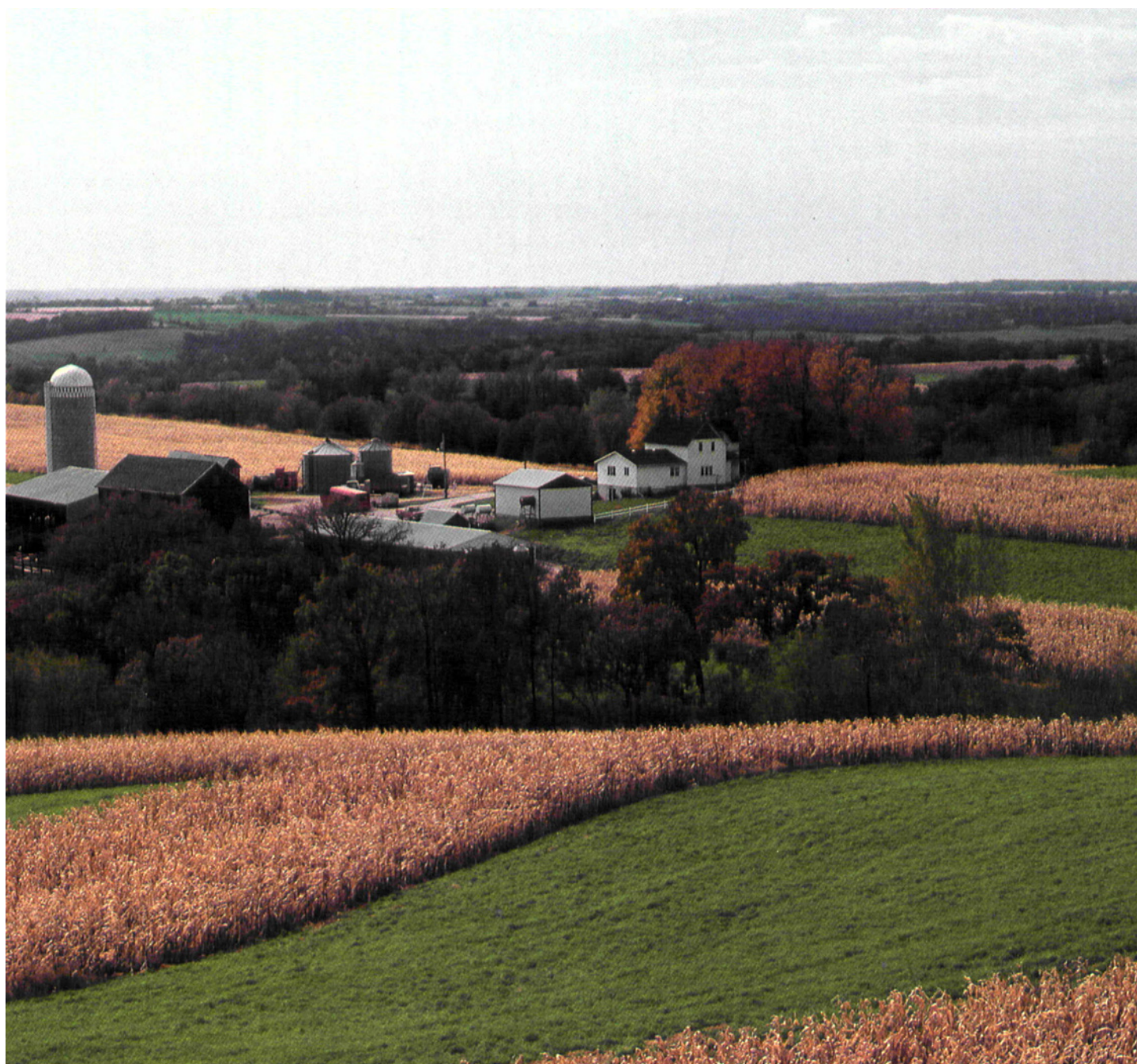
**USDA** United States  
Department of  
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Natural  
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Conservation  
Service

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 Allamakee 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**, which is the color map preceding the detailed soil maps, 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** follow the general soil map. These maps can be useful in planning the use and management of small areas.

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

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

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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 the period 1984-89. Soil names and descriptions were approved in 1990. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1989. 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. It is part of the technical assistance furnished to the Allamakee County Soil and Water Conservation District. Funds appropriated by Allamakee 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.

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

**Cover: An area of the Fayette-Nordness-Dubuque association in Allamakee County. Strips of corn, oats, and hay planted on the contour help to control erosion in these gently rolling to hilly areas.**

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# Foreword

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

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

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

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

LeRoy Brown, Jr.  
State Conservationist  
Natural Resources Conservation Service



# Soil Survey of Allamakee County, Iowa

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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.

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

Allamakee County is in the northeast corner of Iowa (fig. I-1). It is bordered on the north by Houston County, Minnesota; on the south by Clayton County, Iowa; and on the west by Winneshiek County, Iowa. The Mississippi River forms the eastern boundary with Vernon and Crawford Counties, Wisconsin.

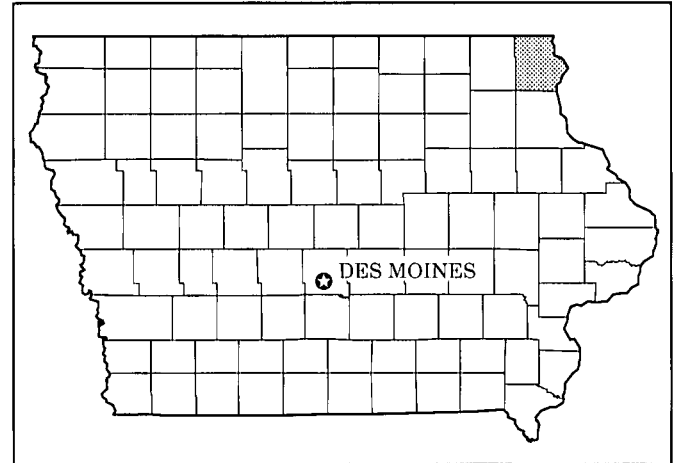


Figure I-1.—Location of Allamakee County in Iowa.

Allamakee County has an area of about 422,200 acres, or approximately 660 square miles. In 1980, the population of the county was 15,108. The population has been steadily decreasing since 1880, when it reached a peak of 19,791. In 1980, Waukon, the county seat, had a population of 3,983, or about 25 percent of the total population of the county. About 28 percent of the people lived on farms at this time (Iowa Department of Economic Development, 1987).

About 52 percent of the county is cropland, 40 percent is woodland, 7 percent is permanent pasture, and 1 percent is urban land. Dairy farming, raising cattle for beef, and raising hogs for pork are the principal farming enterprises (Clements, 1988).

This soil survey updates the survey of Allamakee County published in 1958. It provides additional information and has larger maps, which show the soils in greater detail (Scholtes and others, 1958).

### History

Native Americans have been an important part of Allamakee County history for the past 12,000 years or more. The extensive system of ceremonial mounds at Effigy Mounds National Monument is testimony to the tribes that lived in the area 2,500 years ago. The tribes of the Dakotas were the dominant tribes in recent history.

Because the high bluffs along the Mississippi River and the thick forests made access to the area very difficult, the exploration of the survey area by early pioneers was delayed. Areas to the north and south were explored and settled first. The earliest permanent European settlement was at the Indian Mission on the Yellow River in 1833.

Allamakee County was established in February of 1847. Scott Shattuck and his family were the first immigrants to settle in the county. They settled on the relatively flat plains in the center of the county at the site of the present county seat, Waukon. Waukon was platted and designated as the county seat in 1853.

### **Farming, Natural Resources, and Transportation Facilities**

Farming is of major economic importance in Allamakee County. It provides a livelihood not only for farmers but also for many involved in agribusiness.

Because of the steepness of most of the farm ground in the county, raising beef cattle and hogs and dairy farming are the principal farming enterprises. In 1985, there were 1,100 farms in the county. The average farm size was 340 acres. Only 3 years before that, however, there were 1,170 farms with an average size of 325 acres.

Allamakee County has a variety of natural resources in addition to agricultural land. These include limestone, sand, gravel, trees, water, and natural beauty.

Limestone is near the surface in many areas throughout the county. The limestone is crushed and used commercially for road building or concrete and as a source of lime for agronomic uses. There are a few sand and gravel pits.

In 1988, commercial forest land totaled 100,300 acres, including 283,398 thousand board feet of sawtimber. There are two active wood products mills.

The natural beauty of the forests and limestone bluffs attracts many tourists to the county. The area along the Mississippi River has been called "Little Switzerland." Several parks have been developed on the scenic heights overlooking the Mississippi River and along Paint Creek. Prehistoric Native American heritage is preserved at Effigy Mounds National Monument.

Allamakee County is accessed by State highways 9, 51, and 76. There are 94 miles of State highways, 3 miles of U.S. highway, and 49 miles of municipal roads. Gravel and dirt roads provide access to even the most remote areas. The Northeast Regional Transit system serves the county. There is one bus system, and motor freight freely accesses all urban areas within the county.

There are two main rail freight lines. Public, unattended airports are in both Waukon and Postville. A barge terminal on the Mississippi River at Lansing provides fleeting/harbor services.

### **Physiography and Drainage**

The topography in most of the county is characterized by rolling to hilly or steep relief. Typical

upland features are narrow ridgetops bordered by steep side slopes having numerous outcrops of limestone and sandstone. The topography along the Mississippi River and the lower reaches of its tributaries is very steep and rugged. Limestone bluffs rise abruptly to a height of 300 feet above the Mississippi River.

In contrast, the topography in the west-central part of the county is characterized by gently rolling, undulating relief and areas pock-marked with sinkholes.

Sinkholes are scattered throughout the county, although they are concentrated in the west-central part of the county. They are a major factor in the drainage of the county. Many are open at the surface and are increasing in size. Others are mantled with soil material and are not growing. Some sinkholes are shallow and are cultivated, but many are deep and cannot be crossed by farm machinery. Each year several new sinkholes form, generally after a period of heavy precipitation.

Sinkholes may be a direct cause of underground water pollution. In a few areas, surface water that carries barnyard runoff, septic tank effluent, and agricultural chemicals drains into sinkholes. This surface runoff moves directly into underground water supplies and pollutes them to dangerous levels with these contaminants.

The principal watercourse in the county is the Mississippi River. The other major streams are the Upper Iowa River, the Yellow River, Village Creek, and Paint Creek, all of which drain into the Mississippi River. Slightly more than the upper one-third of the county is drained by the Upper Iowa River and its tributaries. The southern quarter of the county is drained by the Yellow River and its tributaries. The central quarter of the county is drained by Village and Paint Creeks. The rest of the county drains directly into the Mississippi River.

### **Climate**

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

In winter, the average temperature is 18 degrees F and the average daily minimum temperature is 10 degrees. The lowest temperature on record, which occurred at Waukon on January 30, 1951, is -31 degrees. In summer, the average temperature is 69 degrees and the average daily maximum temperature is 79 degrees. The highest temperature, which occurred at Waukon on August 17, 1988, is 99 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 (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 29.54 inches. Of this, 22.24 inches, or 75 percent of the total, usually falls in April through September. The growing season for most crops falls within this period. The heaviest recorded 1-day rainfall was 4.72 inches at Waukon on August 6, 1951. Thunderstorms occur on about 40 days each year, and most occur in June.

The average seasonal snowfall is 28.8 inches. The

greatest snow depth at any one time during the period of record was 23 inches. On the average, 13 days of the year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 14 inches.

The average relative humidity in midafternoon is about 61 percent. Humidity is higher at night, and the average at dawn is about 83 percent. The sun shines 70 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 10 miles per hour, in April.



## TEMPERATURE AND PRECIPITATION

(Recorded in the period 1961-90 at Waukon, 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>Units</u>	<u>In</u>	<u>In</u>	<u>In</u>	<u>In</u>	<u>In</u>	
January-----	22.7	5.8	14.3	46	-26	0	0.47	0.16	0.79	1	6.5
February-----	28.8	11.3	20.1	51	-20	0	.57	.27	.93	2	4.9
March-----	41.3	23.5	32.4	71	-6	11	1.60	.79	2.30	4	6.6
April-----	57.3	36.3	46.8	82	15	77	3.20	1.91	4.36	6	1.2
May-----	69.2	47.8	58.5	86	29	281	3.56	2.13	4.84	7	.0
June-----	77.4	57.2	67.3	91	42	516	4.18	2.25	5.88	7	.0
July-----	81.5	61.8	71.7	94	48	662	3.80	2.02	5.37	6	.0
August-----	79.2	59.3	69.3	92	45	595	3.97	1.91	5.76	6	.0
September---	70.9	51.0	61.0	87	32	337	3.53	1.42	5.31	6	.0
October-----	60.2	40.1	50.2	82	21	116	2.19	1.07	3.16	5	.0
November-----	43.1	26.6	34.9	65	0	9	1.61	.67	2.51	3	2.5
December-----	27.4	12.1	19.8	54	-20	0	.86	.43	1.34	3	7.1
Yearly:											
Average---	54.9	36.1	45.5	---	---	---	---	---	---	---	---
Extreme---	---	---	---	95	-27	---	---	---	---	---	---
Total-----	---	---	---	---	---	2,604	29.54	24.38	34.26	56	28.8

\* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

## FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1961-90 at Waukon, 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. 19	May 2	May 16
2 years in 10 later than--	Apr. 15	Apr. 27	May 11
5 years in 10 later than--	Apr. 8	Apr. 17	Apr. 30
<b>First freezing temperature in fall:</b>			
1 year in 10 earlier than--	Oct. 18	Oct. 3	Sept. 25
2 years in 10 earlier than--	Oct. 23	Oct. 9	Sept. 29
5 years in 10 earlier than--	Oct. 31	Oct. 19	Oct. 8

## GROWING SEASON

(Recorded in the period 1961-90 at Waukon, 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	177	158	136
8 years in 10	182	165	144
5 years in 10	192	178	159
2 years in 10	202	190	174
1 year in 10	208	197	181

# 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. Downs-Fayette Association

### **Setting**

*Landscape:* Uplands

*Slope range:* 2 to 14 percent

### **Composition**

*Percent of survey area:* 16 percent

*Extent of components in the association:*

Downs soils—50 percent

Fayette soils—35 percent

Minor soils—15 percent (fig. 1-2)

### **Soil Properties and Qualities**

#### **Downs**

*Drainage class:* Well drained

*Landscape:* Uplands

*Landform:* Hills

*Geomorphic component:* Divides, interfluves, side slopes, and head slopes

*Hillslope position:* Summits, shoulders, and back slopes

*Slope:* 2 to 14 percent

*Parent material:* Loess

#### **Fayette**

*Drainage class:* Well drained

*Landscape:* Uplands

*Landform:* Hills

*Geomorphic component:* Divides, interfluves, side slopes, and head slopes

*Hillslope position:* Summits, shoulders, and back slopes

*Slope:* 2 to 14 percent

*Parent material:* Loess

### **Minor Soils**

- Frankville and similar soils
- Dubuque and similar soils
- Eitzen and similar soils
- Otter and similar soils
- Tama and similar soils
- Worthen and similar soils

## 2. Fayette-Nordness-Dubuque Association

### **Setting**

*Landscape:* Uplands

*Slope range:* 5 to 40 percent

### **Composition**

*Percent of survey area:* 25 percent

*Extent of components in the association:*

Fayette soils—45 percent

Nordness soils—20 percent

Dubuque soils—15 percent

Minor components—20 percent (fig. 1-3)

### **Soil Properties and Qualities**

#### **Fayette**

*Drainage class:* Well drained

*Landscape:* Uplands

*Landform:* Hills

*Geomorphic component:* Side slopes and head slopes

*Hillslope position:* Shoulders and back slopes

*Slope:* 5 to 40 percent

*Parent material:* Loess (fig. 1-4)

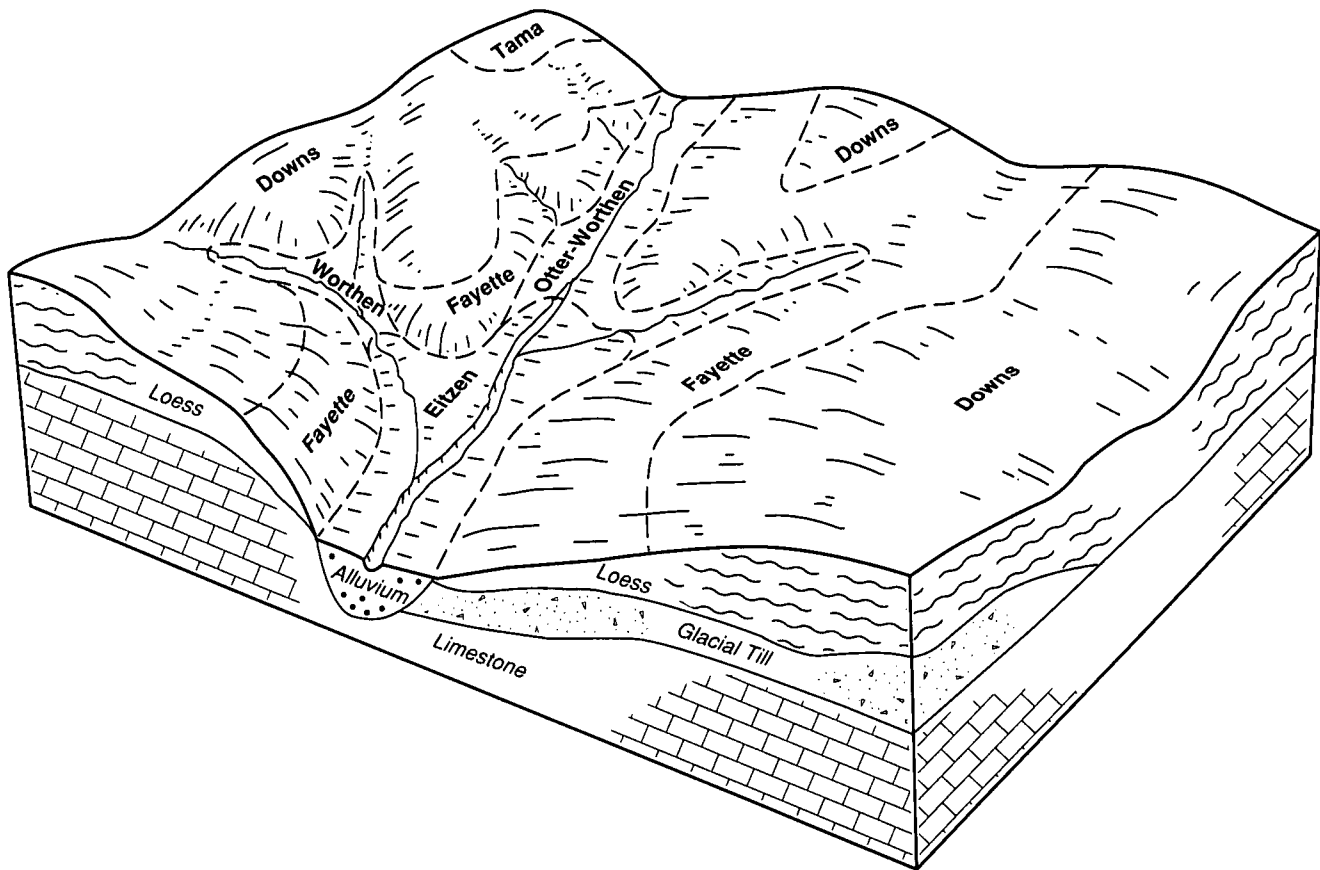


Figure 1-2.—Typical pattern of soils and parent material in the Downs-Fayette association.

#### **Nordness**

*Drainage class:* Well drained

*Landscape:* Uplands

*Landform:* Hills

*Geomorphic component:* Side slopes and nose slopes

*Hillslope position:* Shoulders and back slopes

*Slope:* 5 to 40 percent

*Parent material:* Loamy pedisements over limestone bedrock

#### **Dubuque**

*Drainage class:* Well drained

*Landscape:* Uplands

*Landform:* Hills

*Geomorphic component:* Side slopes and nose slopes

*Hillslope position:* Shoulders and back slopes

*Slope:* 5 to 25 percent

*Parent material:* Loess and a thin layer of clayey residuum over limestone bedrock

#### **Minor Components**

- Arenzville and similar soils
- Boone and similar soils
- Downs and similar soils
- Frankville and similar soils
- Rock outcrop
- Volney and similar soils

### **3. Lacrescent-Fayette-Village Association**

#### **Setting**

*Landscape:* Uplands

*Slope range:* 5 to 70 percent

#### **Composition**

*Percent of survey area:* 45 percent

*Extent of components in the association:*

Lacrescent soils—40 percent

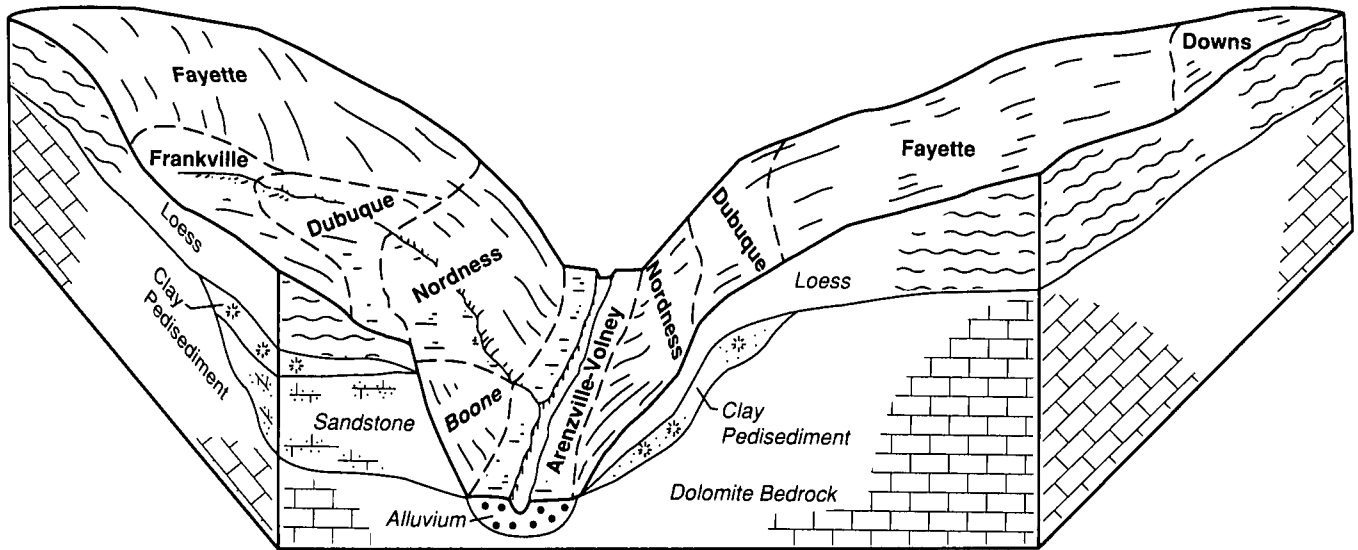


Figure I-3.—Typical pattern of soils and parent material in the Fayette-Nordness-Dubuque association.

Fayette soils—30 percent  
 Village soils—15 percent  
 Minor soils—15 percent (fig. I-5)

### ***Soil Properties and Qualities***

#### **Lacrescent**

*Drainage class:* Well drained  
*Landscape:* Uplands  
*Landform:* Hills  
*Geomorphic component:* Side slopes and nose slopes  
*Hillslope position:* Back slopes  
*Slope:* 14 to 70 percent  
*Parent material:* Pedisidiment

#### **Fayette**

*Drainage class:* Well drained  
*Landscape:* Uplands  
*Landform:* Hills  
*Geomorphic component:* Side slopes and head slopes  
*Hillslope position:* Shoulders and back slopes  
*Slope:* 5 to 40 percent  
*Parent material:* Loess

#### **Village**

*Drainage class:* Well drained  
*Landscape:* Uplands  
*Landform:* Hills  
*Geomorphic component:* Side slopes and nose slopes  
*Hillslope position:* Shoulders and back slopes  
*Slope:* 5 to 25 percent  
*Parent material:* Loess over residuum

### ***Minor Soils***

- Arenzville and similar soils
- Eitzen and similar soils
- Paintcreek and similar soils
- Volney and similar soils
- Yellowriver and similar soils

## **4. Ion-Eitzen-Bertrand Association**

### ***Setting***

*Landscape:* Flood plains and stream terraces  
*Slope range:* 0 to 5 percent

### ***Composition***

*Percent of survey area:* 6 percent  
*Extent of components in the association:*  
 Ion soils—55 percent  
 Eitzen soils—25 percent  
 Bertrand soils—10 percent  
 Minor soils—10 percent

### ***Soil Properties and Qualities***

#### **Ion**

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

#### **Eitzen**

*Drainage class:* Moderately well drained

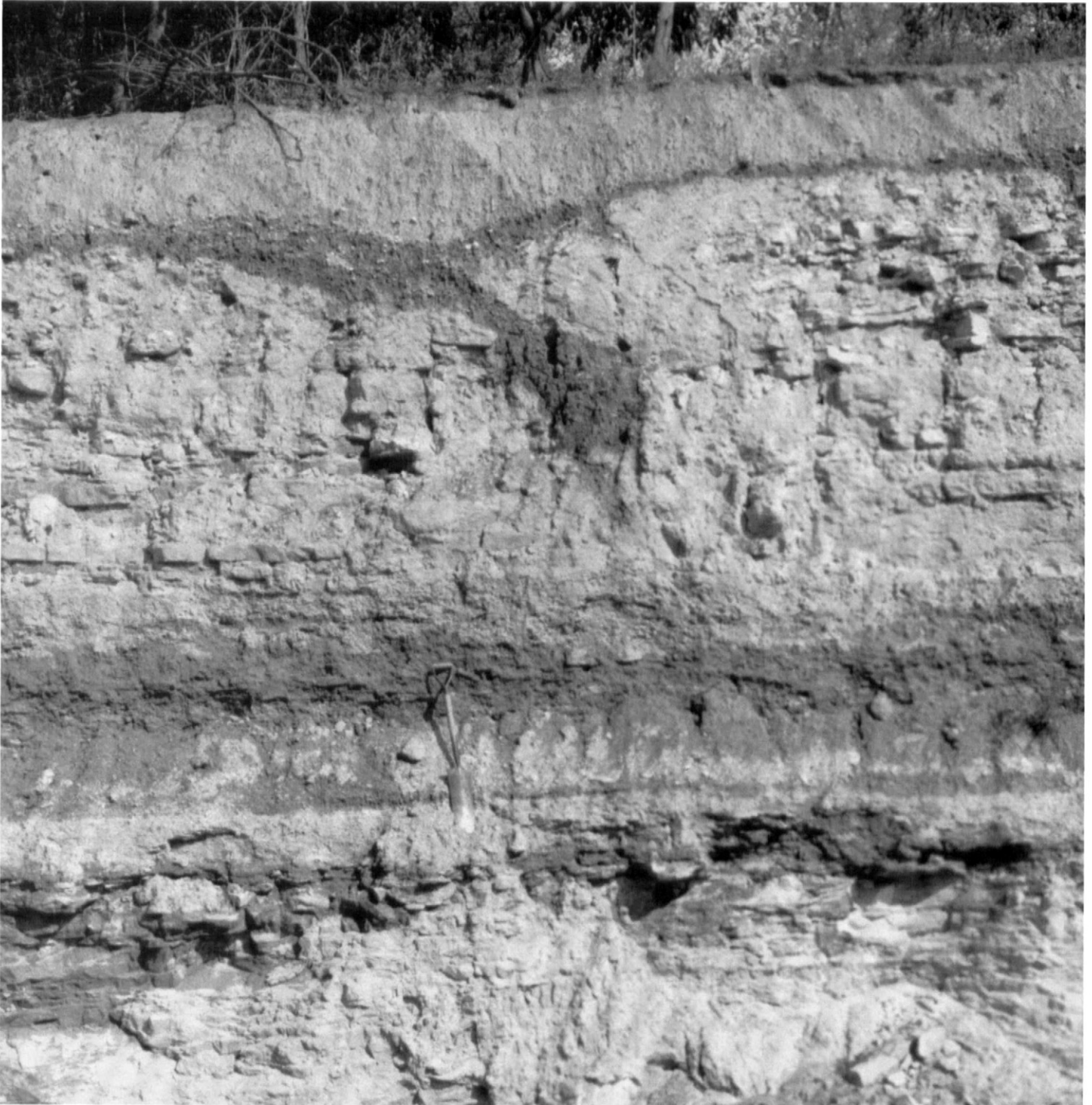


Figure 1-4.—A cross section showing the loess parent material over limestone, shale, and sandstone bedrock in an area of Fayette soils.

*Landscape:* Flood plains  
*Landform:* Flood plains

*Slope:* 0 to 2 percent  
*Parent material:* Alluvium

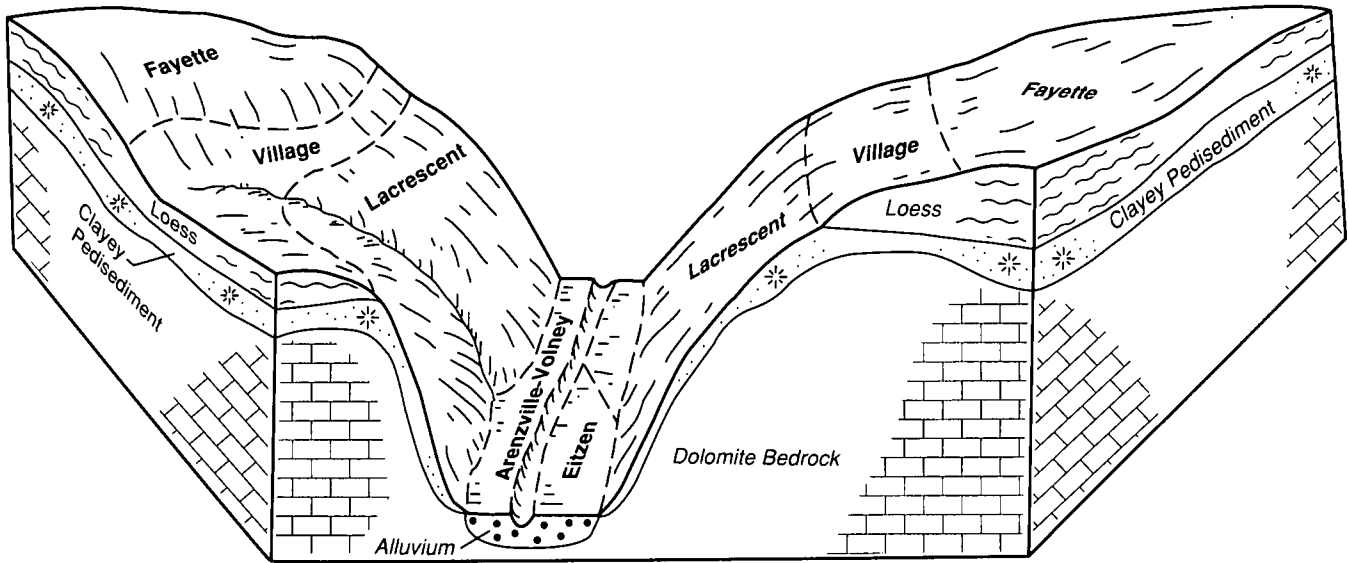


Figure I-5.—Typical pattern of soils and parent material in the Lacrescent-Fayette-Village association.

**Bertrand**

*Drainage class:* Well drained  
*Landscape:* Stream terraces  
*Landform:* Terraces  
*Geomorphic component:* Treads and risers  
*Slope:* 2 to 5 percent  
*Parent material:* Silty alluvium over sand and gravel

**Minor Soils**

- Elon and similar soils
- Festina and similar soils

**5. Chelsea-Sparta Association**

**Setting**

*Landscape:* Stream terraces  
*Parent material:* Alluvium  
*Slope range:* 2 to 14 percent

**Composition**

*Percent of survey area:* 1 percent  
*Extent of components in the association:*  
 Chelsea soils—50 percent  
 Sparta soils—40 percent  
 Minor soils—10 percent

**Soil Properties and Qualities**

**Chelsea**

*Drainage class:* Excessively drained  
*Landscape:* Stream terraces

*Landform:* Terraces

*Geomorphic component:* Treads and risers

*Slope:* 2 to 14 percent

*Parent material:* Eolian and alluvial sandy sediment

**Sparta**

*Drainage class:* Excessively drained

*Landscape:* Stream terraces

*Landform:* Terraces

*Geomorphic component:* Treads and risers

*Slope:* 2 to 14 percent

*Parent material:* Eolian sand

**Minor Soils**

- Waukee and similar soils

**6. Caneek Association**

**Setting**

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

**Composition**

*Percent of survey area:* 7 percent  
*Extent of components in the association:*  
 Caneek soils—60 percent  
 Minor soils—40 percent

**Soil Properties and Qualities**

**Caneek**

*Drainage class:* Poorly drained

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

*Parent material:* Alluvium

***Minor Soils***

- Orion and similar soils



# 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. The classification and extent of the soils in this survey area are shown in the tables "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," which are at the end of this section.

## Formation of the Soils

Soil forms through processes acting 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 plant and animal life, chiefly plants, 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 profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of parent material into a soil. A long period generally is needed for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the others.

## Climate

The soils in Allamakee County probably formed under the influence of a midcontinental subhumid climate for at least 7,000 years. Between 7,000 and 16,000 years ago, the climate favored the growth of forest vegetation (Ruhe, 1956; Walker, 1966). The

morphology of most of the soils in the county indicates that the climate under which they formed is similar to the present one. The climate generally is uniform throughout the county but is marked by wide seasonal extremes in temperature. Precipitation is distributed throughout the year.

Climate is a major factor in determining what soils form in the various parent materials. It affects the rate and intensity of hydrolysis, carbonation, oxidation, and other important chemical reactions in the soil. Temperature, rainfall, relative humidity, and length of the frost-free period affect the kind of vegetation on the soil.

Local conditions somewhat modify the effect of the general climate of a region on soil formation. For example, the microclimate on south-facing slopes is warmer and less humid than that in nearby areas. Low lying, poorly drained areas are wetter and colder than most of the areas around them.

## Living Organisms

Plants and animals have an important effect on soil formation. Plant life is especially significant because it helps to initiate soil formation. As they grow and die, plants add organic matter to the upper layers of the soil. The native grasses, which have numerous fibrous roots that extend to a depth of 10 to 20 inches, add large amounts of organic matter to the surface layer. Trees commonly feed on plant nutrients deep in the subsoil. As a result, they add little organic matter to the surface layer other than that added by fallen leaves and dead branches or trunks. Much of the organic matter from dead trees remains on the surface or is lost through decomposition.

Muscatine and Tama soils are typical of soils that formed under prairie grasses. Dubuque, Fayette, and Village soils are typical of soils that formed under trees. Downs, Frankville, and Allamakee soils have properties intermediate between those of soils that formed entirely under prairie grasses and those of soils that formed entirely under trees. Soils that formed under trees have a dark surface layer that generally is less than 5 inches thick. They have a lighter colored E horizon directly

below the surface layer. In contrast, soils that formed under prairie grasses contain a large amount of organic matter derived from roots and have a thick dark surface layer.

Tama, Downs, and Fayette soils are members of a biosequence, or a group of soils that formed in the same parent material and under similar environmental conditions but supported different kinds of native vegetation. Tama soils formed under prairie grasses, Downs soils under mixed grasses and trees, and Fayette soils under trees. The main morphological differences among the three soils result from the different kinds of native vegetation.

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

### Parent Material

The accumulation of parent material is the first step in the formation of a soil. Some thin layers of several soils in the county formed as a result of the weathering of bedrock. Most of the soils, however, formed in material that was transported from the site of the parent rock and deposited at a new location through the action of glacial ice, water, wind, and gravity.

The principal parent materials in the county are loess, alluvium, residuum, colluvium, and erosional sediments. Much less extensive are lacustrine deposits and eolian sand.

Loess, a silty material deposited by the wind, covers about 85 percent of the county. It ranges in depth from about 5 to 15 feet on the more stable ridges to a thin mantle of less than 5 feet on the side slopes. It overlies limestone bedrock or clayey pedisegment. The base of the Wisconsin-age loess in Iowa is 16,550 to 29,000 years old (Ruhe, 1969). Loess consists mostly of silt and some clay. It does not contain coarse sand or gravel, which were too large to be moved by the wind, but it does contain small amounts of fine sand and very fine sand, generally less than 5 percent.

Downs, Fayette, and Tama soils formed in a layer of loess more than 60 inches thick. Dubuque and Frankville soils formed in a layer of loess less than 40 inches thick over limestone. Nordness soils formed in a very thin layer of loess underlain by bedrock. Village and Allamakee soils formed in a layer of loess less than 40 inches thick over clayey pedisegment. Paintcreek soils formed in a very thin layer of loess underlain by clayey pedisegment.

Alluvium is material that has been deposited by rivers and streams. Alluvial deposits of Late Wisconsin age are on the flood plains and terraces in the county. The major areas where the soils formed in alluvium are along the Upper Iowa, Yellow, and Mississippi Rivers and their tributaries. Large flood plains are along the

Mississippi and Upper Iowa Rivers.

Much of the alluvium in the county washed from loess-covered slopes in the uplands. The alluvial sediments commonly are silty and low in content of sand. Arenzville, Chaseburg, Elon, Huntsville, Ion, and Otter soils formed in silty alluvium. Spillville soils formed in loamy alluvium. They contain more sand than the silty soils.

Textural differences among the alluvial soils are accompanied by some variations in the chemical and mineralogical composition of the soils. Some soils formed in recently deposited, calcareous alluvium. Examples are Caneek, Ion, and Volney soils. The other alluvial soils on flood plains are free of carbonates and are neutral to medium acid.

Some alluvial material on foot slopes has been transported only short distances. This local alluvium retains many characteristics of the soils on the slopes from which it has eroded. Worthen soils, which are on alluvial fans and foot slopes directly below loess-covered slopes, formed in this material.

The soils on terraces also formed in alluvium. They are above the flood plain and generally are not subject to flooding. Most are underlain by coarser textured material within a depth of 4 to 6 feet. The texture of these soils varies. Bertrand and Festina soils formed in silty alluvium, whereas Sattre and Waukee soils formed in loamy alluvium overlying coarse sand and gravel.

Colluvium is soil material, rock fragments, or both moved by creep, slide, or local wash and deposited lower on the slopes. Colluvial deposits are on the steep and very steep side slopes along the major rivers and their tributaries in the county.

Much of the colluvium in the county is derived from physical weathering, the freezing and thawing of the bedrock, and movement by gravity. The colluvial sediments are silty or loamy. Lacrescent soils formed in colluvial sediments.

Erosional sediments are materials that have been reworked and moved mainly by water. The erosional sediments in the county are derived from residuum, glacial till, and bedrock fragments.

A deposit of loess overlies the erosional sediments in Allamakee County. Village and Allamakee soils formed in 20 to 40 inches of loess over the clayey erosional sediments. Paintcreek soils formed in less than 20 inches of loess over the clayey erosional sediments.

Residuum is material weathered in place from sedimentary rocks. Limestone, sandstone, and shale are the types of sedimentary rocks in Allamakee County. In most areas loess covers the residuum.

In Allamakee County the layer of residuum generally is less than 6 inches thick over bedrock. A deposit of

loess overlies a thin layer of residuum in Dubuque and Frankville soils.

The residuum commonly is silty clay or clay. Material weathered from limestone or sandstone commonly has a reddish hue, whereas material weathered from shale is more yellowish.

Eolian sand is not extensive in Allamakee County. It is deposited along the valleys of the major streams. These deposits are much higher in content of sand than the deposits of loess.

Wind-deposited sand is mainly fine and very fine quartz that is highly resistant to weathering. It has not been altered appreciably since it was deposited. Chelsea and Sparta soils formed mainly in wind-deposited loamy sand.

Lacustrine sediments are deposited in lake water. They are exposed when the water level in the lakes is lowered or the elevation of the land is raised. These sediments are not extensive in Allamakee County. They are only on high benches along tributaries of the Mississippi River. Slack-water material was deposited when the Mississippi River was blocked late in the glacial period. This material extends to about 3 miles from the river along some of its tributaries.

The lacustrine deposits in the county are clayey. The content of clay ranges from 40 to 80 percent. The deposits are 2 to 5 feet thick over silty alluvial sediments. Medary and Zwingle soils formed in these deposits.

### Relief

Relief indirectly affects soil formation through its effect on drainage. In Allamakee County, relief ranges from nearly level to very steep. Many nearly level soils are frequently flooded and have a seasonal high water table. Water soaks into nearly level soils that are not flooded. Much of the rainfall runs off the surface of the more sloping soils, and less penetrates the surface. The steeper Nordness soils are examples. They show very little evidence of soil formation.

The color of the subsoil is affected by natural drainage. The subsoil is dominantly olive gray, for example, in the poorly drained Otter soils. It is dominantly yellowish brown in the well drained Bertrand, Downs, Fayette, Festina, and Tama soils, which have a seasonal high water table below a depth of 6 feet. The subsoil tends to be grayish brown and mottled in the somewhat poorly drained Atterberry, Muscatine, and Rowley soils. Of the soils that formed under prairie grasses, those that have a seasonal high water table generally contain more organic matter in the surface layer than those that are well drained.

Some of the properties of Downs, Fayette, Village, and other soils that have a wide slope range vary

according to the slope. Examples of these properties are the depth to carbonates and the thickness of the surface layer. Carbonates are closer to the surface in areas where slopes are steepest. Also, the surface layer is thinner in these areas. Other properties that vary according to the slope are the maximum percent of clay in the B horizon and the depth to the layer that has the highest content of clay. Both of these properties decrease with increasing slope.

Slope aspect, topographic position, and slope gradient have significant effects on soil formation. Soils on south-facing slopes, for example, generally are warmer and drier than soils on north-facing slopes and consequently support a different kind and amount of vegetation. The nearly level Richwood, Rowley, and Otter soils formed in the same kind of parent material and under similar vegetation but differ because of slight differences in topographic position. Their microrelief affects runoff and the depth to the seasonal high water table. The poorly drained Otter soils are at low elevations on flood plains. They have a seasonal high water table, and water is impounded in areas of these soils for short periods. The somewhat poorly drained Rowley soils are at the slightly higher elevations on stream terraces, and the well drained Richwood soils are at the higher elevations. Worthen soils are on foot slopes and in upland waterways. They have properties related to the upslope soils from which they receive sediments.

The influence of porous, rapidly permeable parent material may override the influence of topography. Although they are only gently sloping, Hawick soils are excessively drained because they have a very rapidly permeable subsoil.

### Time

Time is needed for the various processes of soil formation to take effect. The amount of time needed ranges from a few years for the formation of a thin A horizon in fresh alluvial deposits, such as the A horizon in Canek silt loam, channeled, to a thousand years or more for the formation of a subsoil in many of the older upland soils. The older soils have well defined genetic horizons. Downs and Fayette soils are examples. The younger soils have only weakly expressed horizons. Some of the soils that formed in alluvium, for example, show little or no evidence of profile development because fresh material is deposited periodically. The material has not been in place long enough for the climate and vegetation to influence the formation of well defined genetic horizons.

If other factors are favorable, the texture of the subsoil generally becomes finer and a greater amount of soluble material is leached out as the soils continue

to weather. Exceptions are soils that formed in quartz sand, such as Sparta soils, or in other material that is resistant to weathering. These soils do not change much over a long period. Other exceptions are the steep Nordness soils. These soils form more slowly than the less sloping soils in stable areas because only a small amount of water penetrates the surface and a large amount runs off.

In areas where ice, water, or wind has buried organic material under soil material, the age of a landscape can be determined through radiocarbon dating (Ruhe and others, 1955). Radiocarbon dates indicate that the loess in which Downs, Fayette, and Tama soils formed is probably about 14,000 to 20,000 years old.

### Human Activities

Important changes took place when Allamakee County was settled. Some of these changes had little effect on soil productivity, but others had a drastic impact.

Breaking the prairie sod and clearing the timber removed or changed the protective plant cover. Cultivation increases the susceptibility of the more sloping soils to erosion, which removes topsoil, organic matter, and plant nutrients. Sheet erosion, the most prevalent kind of erosion in the county, removes a few inches of topsoil at one time. Cultivation generally destroys all evidence of this loss. In some areas, shallow and deep gullies have formed and the eroded soil material has been deposited on the lower slopes. As the land was brought under cultivation, the runoff rate increased and the rate at which water moved into the soil decreased. As a result, accelerated erosion removed part or all of the original surface layer from many of the more sloping soils.

Cultivation and erosion changed the structure and consistence of the surface layer of some soils and the content of organic matter and level of fertility. In severely eroded areas the plow layer commonly includes the upper part of the subsoil, which is less friable and finer textured than the surface layer. Even in areas that are not subject to erosion, compaction by heavy machinery reduces the thickness of the surface layer and changes the soil structure. The granular structure characteristic of native grassland breaks down when the soils are intensively cropped. The surface layer of these soils generally is hard when dry. Fine textured soils that have been plowed many times during wet periods tend to puddle and are more slowly permeable than similar soils in uncultivated areas.

Eroded soil material from hillsides commonly is deposited in the lower lying areas. For example, Arenzville, Caneek, and Ion soils, which formed in recent alluvium, have strata of light and dark colored

soil material washed from the hillsides and deposited by floodwater.

Some management measures decrease the susceptibility to erosion, increase soil productivity, and reclaim areas not suitable for crops or pasture. For example, large areas on bottom land are suitable for cultivation because flooding and deposition are controlled by diversions at the base of slopes, by drainage ditches, and by other measures. Many soils are more productive than they were naturally because applications of commercial fertilizer and lime have overcome deficiencies in plant nutrients. In some areas erosion and runoff are controlled by terraces and other measures.

Erosion is the main cause of a decrease in the content of organic matter in soils (Smith and others, 1950). Although they cannot increase the organic matter content to the level that was characteristic of native grassland, measures that control erosion can keep the content at a level that is needed when crops are grown.

### Processes of Soil Formation

Horizon differentiation is the result of four basic processes. These are additions, removals, transfers, and transformations (Simonson, 1959). Each of these affects many substances in the soil, such as organic matter, soluble salts, carbonates, sesquioxides, and silicate clay minerals. The changes brought about by these processes help to determine the ultimate nature of the soil profile.

The accumulation of organic matter is an early phase in the formation of most soils. The content of organic matter ranges from very high to very low in the A horizon of the soils in Allamakee County. It is low in the thin A horizon of Fayette soils and high in the thick A horizon of Garwin soils. In some soils it is low because erosion has removed part of the A horizon.

The removal of substances from parts of the profile has differentiated horizons in most of the soils in the county. The downward movement of calcium carbonate and bases is an example. Free carbonates have been leached from the upper part of nearly all of the soils. Exceptions are Caneek, Elon, and Ion soils. Some soils are so strongly leached that they are strongly acid or very strongly acid in the subsoil.

A number of substances are transferred from one horizon to another. Phosphorus, for example, is removed from the subsoil by plant roots and transferred to the parts of the plant growing above the ground. It is then added to the surface layer in the plant residue. This process affects the form and distribution of the phosphorus in the profile.

The translocation of silicate clay minerals has an

important effect on horizon differentiation. The clay minerals are carried downward in suspension by percolating water from the A horizon. They accumulate in the B horizon as fillings in pores and root channels and as clay films on the faces of peds. This process has affected many of the soils in the county. In other soils, the clay content of the A horizon is not markedly different from that of the B horizon and other evidence of clay movement is minimal.

Another kind of transfer occurs only in the very clayey soils. Cracks form when these soils shrink and swell. As a result, some of the material from the surface layer is transferred to the lower parts of the profile. This kind of transfer can occur in Medary and Zwingle soils.

Transformations are physical and chemical. The weathering of soil particles to smaller sizes is an example of transformation. The reduction of iron is another example. This process is called gleying. It occurs when the soil is saturated for long periods. It is evidenced by ferrous iron and gray colors in the soil. It is a characteristic of poorly drained soils, such as Otter soils. Reductive extractable iron, or free iron, generally is not so evident in somewhat poorly drained soils, such as Rowley soils.

Another kind of transformation is the weathering of the primary apatite mineral in the parent material to secondary phosphorus compounds. This process occurs in Otter and other soils that have a pH near 7. The supply of available phosphorus is higher in these soils than in Ion and other soils that have a pH of more than 7.

## Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1975). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. 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 Endoaquolls (*Endo*, meaning within, plus *aquoll*, the suborder of the Mollisols that has an aquic moisture regime).

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

**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-loamy, mixed, mesic Typic Endoaquolls.

**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

Soil name	Family or higher taxonomic class
Allamakee-----	Mollic Hapludalfs, fine-silty over clayey, mixed, mesic
Arenzville-----	Typic Udifluvents, coarse-silty, mixed, nonacid, mesic
Atterberry-----	Udolic Endoaqualfs, fine-silty, mixed, mesic
Bertrand-----	Typic Hapludalfs, fine-silty, mixed, mesic
Boone-----	Typic Quartzipsamments, mesic, uncoated
Caneek-----	Aeric Fluvaquents, fine-silty, mixed (calcareous), mesic
Chaseburg-----	Typic Udifluvents, coarse-silty, mixed, nonacid, mesic
Chelsea-----	Argic Udipsamments, mixed, mesic
Churchtown-----	Mollic Hapludalfs, fine-silty, mixed, mesic
Downs-----	Mollic Hapludalfs, fine-silty, mixed, mesic
Dubuque-----	Typic Hapludalfs, fine-silty, mixed, mesic
Eitzen-----	Mollic Udifluvents, fine-silty, mixed, nonacid, mesic
Elon-----	Aquic Udifluvents, coarse-silty, mixed (calcareous), mesic
Fayette-----	Typic Hapludalfs, fine-silty, mixed, mesic
Festina-----	Mollic Hapludalfs, fine-silty, mixed, mesic
Frankville-----	Mollic Hapludalfs, fine-silty, mixed, mesic
Garwin-----	Typic Haplaquolls, fine-silty, mixed, mesic
Hawick-----	Entic Hapludolls, sandy, mixed, mesic
Huntsville-----	Cumulic Hapludolls, fine-silty, mixed, mesic
Ion-----	Mollic Udifluvents, coarse-silty, mixed (calcareous), mesic
Lacrescent-----	Typic Hapludolls, loamy-skeletal, mixed, mesic
Lawson-----	Cumulic Hapludolls, fine-silty, mixed, mesic
Lycurgus-----	Typic Argiudolls, fine-silty, mixed, mesic
Massbach-----	Mollic Hapludalfs, fine-silty, mixed, mesic
Medary-----	Typic Hapludalfs, fine, mixed, mesic
Muscatine-----	Aquic Hapludolls, fine-silty, mixed, mesic
Nordness-----	Lithic Hapludalfs, loamy, mixed, mesic
Orion-----	Aquic Udifluvents, coarse-silty, mixed, nonacid, mesic
Otter-----	Cumulic Endoaquolls, fine-silty, mixed, mesic
Paintcreek-----	Typic Hapludalfs, fine, mixed, mesic
Richwood-----	Typic Argiudolls, fine-silty, mixed, mesic
Rowley-----	Aquic Argiudolls, fine-silty, mixed, mesic
Sattre-----	Mollic Hapludalfs, fine-loamy over sandy or sandy-skeletal, mixed, mesic
Shullsburg-----	Aquic Argiudolls, fine, mixed, mesic
Sparta-----	Entic Hapludolls, sandy, mixed, mesic
Spillville-----	Cumulic Hapludolls, fine-loamy, mixed, mesic
Tama-----	Typic Argiudolls, fine-silty, mixed, mesic
Village-----	Typic Hapludalfs, fine-silty over clayey, mixed, mesic
Volney-----	Cumulic Hapludolls, loamy-skeletal, mixed, mesic
Waukee-----	Typic Hapludolls, fine-loamy over sandy or sandy-skeletal, mixed, mesic
Worthen-----	Cumulic Hapludolls, fine-silty, mixed, mesic
Yellowriver-----	Typic Hapludalfs, fine-silty, mixed, mesic
Zwingle-----	Typic Albaqualfs, fine, montmorillonitic, mesic

## ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
40D	Fayette silt loam, karst, 2 to 14 percent slopes-----	1,775	0.4
41B	Sparta sand, 2 to 5 percent slopes-----	210	*
41C	Sparta sand, 5 to 9 percent slopes-----	220	*
41D	Sparta sand, 9 to 14 percent slopes-----	310	*
63B	Chelsea loamy sand, 2 to 5 percent slopes-----	170	*
63C	Chelsea loamy sand, 5 to 9 percent slopes-----	400	*
63D	Chelsea loamy sand, 9 to 14 percent slopes-----	395	*
63E	Chelsea loamy sand, 14 to 18 percent slopes-----	600	0.1
63F	Chelsea loamy sand, 18 to 25 percent slopes-----	260	*
63G	Chelsea loamy sand, 25 to 45 percent slopes-----	1,275	0.3
85	Eitzen silt loam, 0 to 2 percent slopes-----	5,500	1.3
85B	Eitzen silt loam, 2 to 5 percent slopes-----	3,980	0.9
98	Huntsville silt loam, 0 to 2 percent slopes-----	1,045	0.2
98B	Huntsville silt loam, 2 to 5 percent slopes-----	240	*
118	Garwin silty clay loam, 0 to 2 percent slopes-----	135	*
119B	Muscatine silt loam, 1 to 4 percent slopes-----	880	0.2
120B	Tama silt loam, 2 to 5 percent slopes-----	2,370	0.6
120C	Tama silt loam, 5 to 9 percent slopes-----	325	*
129B	Arenzville-Chaseburg complex, 1 to 5 percent slopes-----	1,810	0.4
140B	Sparta loamy sand, 2 to 5 percent slopes-----	845	0.2
140C	Sparta loamy sand, 5 to 9 percent slopes-----	270	*
142	Chaseburg silt loam, 0 to 2 percent slopes-----	585	0.1
162B	Downs silt loam, 2 to 5 percent slopes-----	15,350	3.6
162B2	Downs silt loam, 2 to 5 percent slopes, moderately eroded-----	3,150	0.7
162C	Downs silt loam, 5 to 9 percent slopes-----	8,720	2.1
162C2	Downs silt loam, 5 to 9 percent slopes, moderately eroded-----	20,995	5.0
162D	Downs silt loam, 9 to 14 percent slopes-----	1,525	0.4
162D2	Downs silt loam, 9 to 14 percent slopes, moderately eroded-----	8,465	2.0
162E2	Downs silt loam, 14 to 18 percent slopes, moderately eroded-----	320	*
163B	Fayette silt loam, 2 to 5 percent slopes-----	4,175	1.0
163B2	Fayette silt loam, 2 to 5 percent slopes, moderately eroded-----	1,120	0.3
163C	Fayette silt loam, 5 to 9 percent slopes-----	2,665	0.6
163C2	Fayette silt loam, 5 to 9 percent slopes, moderately eroded-----	38,390	9.1
163D	Fayette silt loam, 9 to 14 percent slopes-----	4,525	1.1
163D2	Fayette silt loam, 9 to 14 percent slopes, moderately eroded-----	41,760	9.9
163E	Fayette silt loam, 14 to 18 percent slopes-----	3,505	0.8
163E2	Fayette silt loam, 14 to 18 percent slopes, moderately eroded-----	7,225	1.7
163F	Fayette silt loam, 18 to 25 percent slopes-----	1,245	0.3
163G	Fayette silt loam, 25 to 40 percent slopes-----	300	*
178B	Waukee loam, 1 to 5 percent slopes-----	420	*
196B	Volney channery loam, 2 to 5 percent slopes-----	1,050	0.2
196C	Volney channery loam, 5 to 9 percent slopes-----	400	*
206C	Shullsburg silty clay loam, 3 to 9 percent slopes-----	255	*
210E	Boone loamy sand, 9 to 18 percent slopes-----	400	*
210F	Boone loamy sand, 18 to 25 percent slopes-----	595	0.1
210G	Boone loamy sand, 25 to 40 percent slopes-----	3,325	0.8
249C	Zwingle silt loam, 1 to 9 percent slopes-----	455	0.1
291	Atterberry silt loam, 1 to 3 percent slopes-----	270	*
320	Arenzville silt loam, 0 to 2 percent slopes-----	1,215	0.3
478G	Nordness-Rock outcrop complex, 25 to 60 percent slopes-----	1,185	0.3
484	Lawson silt loam, 0 to 2 percent slopes-----	1,570	0.4
485	Spillville loam, 0 to 2 percent slopes-----	400	*
487B	Otter-Worthen complex, 1 to 4 percent slopes-----	1,495	0.4
490	Caneek silt loam, 0 to 2 percent slopes-----	835	0.2
499C	Nordness silt loam, 5 to 9 percent slopes-----	425	0.1
499D	Nordness silt loam, 9 to 14 percent slopes-----	910	0.2
499D2	Nordness silt loam, 9 to 14 percent slopes, moderately eroded-----	710	0.2
499E	Nordness silt loam, 14 to 18 percent slopes-----	2,855	0.7
499E2	Nordness silt loam, 14 to 18 percent slopes, moderately eroded-----	695	0.2
499F	Nordness silt loam, 18 to 25 percent slopes-----	4,650	1.1
499G	Nordness silt loam, 25 to 40 percent slopes-----	9,435	2.2

See footnote at end of table.

## ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
589	Otter silt loam, 0 to 2 percent slopes-----	305	*
703C	Dubuque silt loam, 5 to 9 percent slopes-----	260	*
703C2	Dubuque silt loam, 5 to 9 percent slopes, moderately eroded-----	805	0.2
703D	Dubuque silt loam, 9 to 14 percent slopes-----	2,005	0.5
703D2	Dubuque silt loam, 9 to 14 percent slopes, moderately eroded-----	5,890	1.4
703E	Dubuque silt loam, 14 to 18 percent slopes-----	3,045	0.7
703E2	Dubuque silt loam, 14 to 18 percent slopes, moderately eroded-----	3,230	0.8
703F	Dubuque silt loam, 18 to 25 percent slopes-----	1,120	0.3
721C	Massbach silt loam, 3 to 9 percent slopes-----	420	*
721D	Massbach silt loam, 9 to 15 percent slopes,-----	260	*
740C	Hawick gravelly sand, 2 to 9 percent slopes-----	240	*
740G	Hawick gravelly sand, 18 to 40 percent slopes-----	375	*
778B	Sattre loam, 1 to 5 percent slopes-----	230	*
793B	Bertrand silt loam, 2 to 5 percent slopes-----	360	*
793C	Bertrand silt loam, 5 to 9 percent slopes-----	410	*
793D2	Bertrand silt loam, 9 to 14 percent slopes, moderately eroded-----	170	*
793E	Bertrand silt loam, 14 to 18 percent slopes-----	180	*
826	Rowley silt loam, 0 to 2 percent slopes-----	210	*
837C	Village silt loam, 5 to 9 percent slopes-----	310	*
837C2	Village silt loam, 5 to 9 percent slopes, moderately eroded-----	890	0.2
837D	Village silt loam, 9 to 14 percent slopes-----	3,055	0.7
837D2	Village silt loam, 9 to 14 percent slopes, moderately eroded-----	11,060	2.6
837E	Village silt loam, 14 to 18 percent slopes-----	6,805	1.6
837E2	Village silt loam, 14 to 18 percent slopes, moderately eroded-----	6,200	1.5
837F	Village silt loam, 18 to 25 percent slopes-----	3,150	0.7
838C2	Allamakee silt loam, 5 to 9 percent slopes, moderately eroded-----	230	*
838D	Allamakee silt loam, 9 to 14 percent slopes-----	285	*
838D2	Allamakee silt loam, 9 to 14 percent slopes, moderately eroded-----	1,585	0.4
838E2	Allamakee silt loam, 14 to 18 percent slopes, moderately eroded-----	390	*
840E	Lacrescent silt loam, 14 to 18 percent slopes-----	230	*
840F	Lacrescent silt loam, 18 to 25 percent slopes-----	705	0.2
840G	Lacrescent silt loam, 25 to 70 percent slopes-----	54,725	13.0
841G	Rock outcrop-Boone complex, 20 to 70 percent slopes-----	2,975	0.7
843	Elon silt loam, 0 to 2 percent slopes-----	1,735	0.4
861D	Yellowriver silt loam, 9 to 14 percent slopes-----	150	*
861D2	Yellowriver silt loam, 9 to 14 percent slopes, moderately eroded-----	180	*
861E	Yellowriver silt loam, 14 to 18 percent slopes-----	1,060	0.3
861E2	Yellowriver silt loam, 14 to 18 percent slopes, moderately eroded-----	335	*
861F	Yellowriver silt loam, 18 to 25 percent slopes-----	1,575	0.4
861G	Yellowriver silt loam, 25 to 40 percent slopes-----	840	0.2
862D	Churchtown loam, 9 to 14 percent slopes-----	330	*
862D2	Churchtown loam, 9 to 14 percent slopes, moderately eroded-----	385	*
862E	Churchtown loam, 14 to 18 percent slopes-----	1,945	0.5
862E2	Churchtown loam, 14 to 18 percent slopes, moderately eroded-----	680	0.2
862F	Churchtown loam, 18 to 25 percent slopes-----	865	0.2
903C2	Frankville silt loam, 5 to 9 percent slopes, moderately eroded-----	355	*
903D	Frankville silt loam, 9 to 14 percent slopes-----	200	*
903D2	Frankville silt loam, 9 to 14 percent slopes, moderately eroded-----	600	0.1
903E2	Frankville silt loam, 14 to 18 percent slopes, moderately eroded-----	365	*
912C	Paintcreek silt loam, 5 to 9 percent slopes-----	200	*
912D	Paintcreek silt loam, 9 to 14 percent slopes-----	1,705	0.4
912D2	Paintcreek silt loam, 9 to 14 percent slopes, moderately eroded-----	1,645	0.4
912E	Paintcreek silt loam, 14 to 18 percent slopes-----	6,015	1.4
912E2	Paintcreek silt loam, 14 to 18 percent slopes, moderately eroded-----	2,090	0.5
912F	Paintcreek silt loam, 18 to 30 percent slopes-----	19,680	4.7
930	Orion silt loam, 0 to 2 percent slopes-----	1,405	0.3
951G	Medary silt loam, 14 to 45 percent slopes-----	520	0.1
977	Richwood silt loam, 0 to 2 percent slopes-----	235	*
977B	Richwood silt loam, 2 to 5 percent slopes-----	235	*
978B	Festina silt loam, 2 to 5 percent slopes-----	575	0.1
978C	Festina silt loam, 5 to 9 percent slopes-----	230	*

See footnote at end of table.



## ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
981B	Worthen silt loam, 2 to 7 percent slopes-----	1,085	0.3
1120D	Lycurgus silt loam, 9 to 14 percent slopes-----	150	*
1120E	Lycurgus silt loam, 14 to 18 percent slopes-----	325	*
1120F	Lycurgus silt loam, 18 to 25 percent slopes-----	165	*
1490	Caneek silt loam, channeled, 0 to 2 percent slopes-----	10,855	2.6
1496	Arenzville-Volney complex, 0 to 2 percent slopes-----	1,885	0.4
1496B	Arenzville-Volney complex, 2 to 5 percent slopes-----	3,880	0.9
1793G	Bertrand-Chelsea complex, 18 to 35 percent slopes-----	865	0.2
2670	Ion silt loam, 0 to 2 percent slopes-----	6,560	1.6
5010	Pits, sand and gravel-----	40	*
5030	Pits, limestone quarries-----	235	*
5040	Orthents, loamy-----	425	0.1
	Water-----	16,900	4.0
	Total-----	422,200	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 maps in Part III of this survey 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 description. 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, Fayette silt loam, 5 to 9 percent slopes, is a phase of the Fayette series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called 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. Arenzville-Volney complex, 2 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. Pits, sand and gravel, 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 "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

### Allamakee Series

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Landscape:* Uplands

*Landform:* Hills

*Geomorphic component:* Side slopes and nose slopes

*Hillslope position:* Shoulders and back slopes

*Parent material:* Loess over residuum

*Native vegetation:* Prairie grasses and open forest

*Slope range:* 5 to 18 percent

#### Typical Pedon

Allamakee silt loam, 9 to 14 percent slopes, in a pasture, 1,400 feet west and 750 feet north of the southeast corner of sec. 21, T. 99 N., R. 4 W.; U.S.G.S. Church, Iowa, Topographic Quadrangle; latitude 91 degrees, 18 minutes, and 33 seconds N. and longitude 43 degrees, 22 minutes, and 21 seconds W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; few (5 percent) brown (10YR 4/3) streaks and pockets; weak fine and very fine subangular blocky structure; friable; common very fine roots; slightly acid; abrupt smooth boundary.

BE—7 to 9 inches; brown (10YR 4/3) silt loam; weak thin and thick platy structure parting to weak fine

and very fine subangular blocky; friable; few very fine roots; slightly acid; clear smooth boundary.

Bt1—9 to 16 inches; dark brown (7.5YR 4/4) silt loam; weak medium and fine subangular blocky structure; friable; few very fine roots; slightly acid; gradual smooth boundary.

Bt2—16 to 23 inches; strong brown (7.5YR 4/6) silty clay loam; moderate fine subangular blocky structure; friable; few very fine roots; medium acid; clear smooth boundary.

2Bt3—23 to 27 inches; dark yellowish brown (10YR 4/4) and dark brown (7.5YR 4/4) clay loam; moderate fine and medium subangular blocky structure; friable; few very fine roots; common black (10YR 2/1) organic stains on faces of peds; about 5 percent coarse fragments ½ to 1 inch in diameter; strongly acid; abrupt wavy boundary.

2Bt4—27 to 32 inches; yellowish red (5YR 4/6) clay; moderate medium and fine subangular blocky structure; firm; few very fine roots; common black (10YR 2/1) organic stains on faces of peds; about 10 percent coarse fragments ½ to 1 inch in diameter; very strongly acid; gradual wavy boundary.

2Bt5—32 to 48 inches; yellowish red (5YR 4/6) cobbly clay; moderate medium and fine subangular blocky and angular blocky structure; firm; common black (10YR 2/1) organic stains on faces of peds; 30 to 35 percent coarse chert and sandstone fragments 1 to 8 inches in diameter; very strongly acid; clear wavy boundary.

2BC—48 to 60 inches; yellowish red (5YR 4/6) and dark yellowish brown (10YR 4/4 and 4/6), stratified sandy loam, loam, sandy clay loam, sandy clay, and clay; weak medium and fine subangular blocky structure; friable; few black (10YR 2/1) organic stains on faces of peds; 10 to 20 percent coarse sandstone fragments 1 to 6 inches in diameter; very strongly acid.

#### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Thickness of the loess:* 20 to 40 inches

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 to 3

Texture—silt loam

*Bt horizon:*

Hue—10YR or 7.5YR

Value—3 or 4

Chroma—4 to 6

Texture—silt loam or silty clay loam

**2Bt horizon:**

Hue—2.5YR, 5YR, or 7.5YR

Value—3 to 7

Chroma—3 to 8

Texture—clay loam or clay

**2BC horizon:**

Hue—5YR, 7.5YR, or 10YR

Value—4 or 5

Chroma—4 to 6

Texture—stratified sandy loam, loam, sandy clay loam, sandy clay, clay loam, and clay

**838C2—Allamakee silt loam, 5 to 9 percent slopes, moderately eroded****Composition**

Allamakee and similar soils: About 95 percent

Inclusions: About 5 percent

**Setting***Landform:* Hills*Position on landform:* Back slopes and foot slopes*Slope:* 5 to 9 percent**Component Description***Surface layer texture:* Silt loam*Depth to bedrock:* Greater than 60 inches*Drainage class:* Well drained*Dominant parent material:* Loess over residuum*Flooding:* None*Depth to the water table:* Greater than 6.0 feet*Available water capacity to 60 inches or root-limiting layer:* About 9.1 inches (high)*Organic matter content in 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 uneroded 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

**838D—Allamakee silt loam, 9 to 14 percent slopes****Composition**

Allamakee and similar soils: About 95 percent

Inclusions: About 5 percent

**Setting***Landform:* Hills*Position on landform:* Back slopes and foot slopes*Slope:* 9 to 14 percent**Component Description***Surface layer texture:* Silt loam*Depth to bedrock:* Greater than 60 inches*Drainage class:* Well drained*Dominant parent material:* Loess over residuum*Flooding:* None*Depth to the water table:* Greater than 6.0 feet*Available water capacity to 60 inches or root-limiting layer:* About 9.5 inches (high)*Organic matter content in 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 eroded 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

**838D2—Allamakee silt loam, 9 to 14 percent slopes, moderately eroded****Composition**

Allamakee and similar soils: About 95 percent

Inclusions: About 5 percent

### Setting

*Landform:* Hills

*Position on landform:* Back slopes and foot slopes

*Slope:* 9 to 14 percent

### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over residuum

*Flooding:* None

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

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

*Organic matter content in 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 uneroded 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

## 838E2—Allamakee silt loam, 14 to 18 percent slopes, moderately eroded

### Composition

Allamakee and similar soils: About 90 percent

Inclusions: About 10 percent

### Setting

*Landform:* Hills

*Position on landform:* Back slopes and foot slopes

*Slope:* 14 to 18 percent

### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over residuum

*Flooding:* None

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

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

*Organic matter content in 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

- Paintcreek and similar soils
- Areas of severely eroded 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

## Arenzville Series

*Drainage class:* Well drained

*Permeability:* Moderate

*Landscape:* Flood plains and uplands

*Landform:* Flood plains and drainageways

*Parent material:* Local alluvium

*Native vegetation:* Prairie grasses

*Slope range:* 0 to 5 percent

### Typical Pedon

Arenzville silt loam, 0 to 2 percent slopes, in a pasture, 875 feet east and 1,180 feet south of the northwest corner of sec. 29, T. 99 N., R. 5 W.; U.S.G.S. Waukon, Iowa, Topographic Quadrangle; latitude 91 degrees, 28 minutes, and 3 seconds N. and longitude 43 degrees, 22 minutes, and 4 seconds W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) silt loam, light grayish brown (10YR 6/2) and grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

C—9 to 23 inches; stratified dark grayish brown (10YR 4/2) and brown (10YR 5/3) silt loam; thin strata of very dark grayish brown (10YR 3/2); massive with horizontal cleavage resulting from stratification;

friable; few fine roots; neutral; abrupt smooth boundary.

Ab1—23 to 47 inches; black (10YR 2/1) silt loam; weak fine subangular blocky structure; friable; few fine roots; neutral; gradual smooth boundary.

Ab2—47 to 60 inches; very dark grayish brown (10YR 3/2) silt loam; common fine distinct dark grayish brown (10YR 4/2) mottles; weak fine subangular blocky structure; friable; neutral.

#### **Range in Characteristics**

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Depth to Ab horizon:* 20 to 40 inches

*A or Ap horizon:*

Hue—10YR

Value—3 to 5

Chroma—1 or 2

Texture—silt loam

*C horizon:*

Hue—10YR

Value—4 or 5 (dominantly)

Chroma—2 or 3 (dominantly)

Texture—silt loam

*Ab horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam or silty clay loam

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

#### **Chaseburg**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Flooding:* Occasional

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

*Available water capacity to 60 inches or root-limiting layer:* About 12.5 inches (high)

*Organic matter content in the surface layer:* About 1 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**

- Volney 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

### **129B—Arenzville-Chaseburg complex, 1 to 5 percent slopes**

#### **Composition**

Arenzville and similar soils: About 50 percent

Chaseburg and similar soils: About 45 percent

Inclusions: About 5 percent

#### **Setting**

*Landform:* Drainageways

*Slope:* 1 to 5 percent

#### **Component Description**

##### **Arenzville**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Flooding:* Occasional

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

*Available water capacity to 60 inches or root-limiting layer:* About 12.5 inches (high)

### **320—Arenzville silt loam, 0 to 2 percent slopes**

#### **Composition**

Arenzville 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:* Well drained

*Dominant parent material:* Local alluvium

*Flooding:* Occasional

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

*Available water capacity to 60 inches or root-limiting layer:* About 12.5 inches (high)

*Organic matter content in 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 that have limestone flags in buried 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

### **1496—Arenzville-Volney complex, 0 to 2 percent slopes**

#### ***Composition***

Arenzville and similar soils: About 45 percent  
Volney and similar soils: About 25 percent  
Inclusions: About 30 percent

#### ***Setting***

*Landform:* Drainageways  
*Slope:* 0 to 2 percent

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

##### **Arenzville**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Flooding:* Frequent  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 12.5 inches (high)  
*Organic matter content in the surface layer:* About 2 percent (moderate)

##### **Volney**

*Surface layer texture:* Channery loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Alluvium  
*Flooding:* Frequent  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 3.6 inches (low)

*Organic matter content in 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***

- Lawson and similar soils
- Spillville and similar soils
- Huntsville 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

### **1496B—Arenzville-Volney complex, 2 to 5 percent slopes**

#### ***Composition***

Arenzville and similar soils: About 45 percent  
Volney and similar soils: About 30 percent  
Inclusions: About 25 percent

#### ***Setting***

*Landform:* Drainageways  
*Slope:* 2 to 5 percent

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

##### **Arenzville**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Alluvium  
*Flooding:* Frequent  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 12.5 inches (high)  
*Organic matter content in the surface layer:* About 2 percent (moderate)

##### **Volney**

*Surface layer texture:* Channery loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Somewhat excessively drained  
*Dominant parent material:* Alluvium



**Flooding:** Frequent**Depth to the water table:** Greater than 6.0 feet**Available water capacity to 60 inches or root-limiting layer:** About 3.6 inches (low)**Organic matter content in 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**

- Huntsville and similar soils
- Lawson and similar soils
- Spillville 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

**Atterberry Series****Drainage class:** Somewhat poorly drained**Permeability:** Moderate**Landscape:** Uplands**Landform:** Interfluves**Geomorphic component:** Summits**Parent material:** Loess**Native vegetation:** Deciduous trees and prairie grasses**Slope range:** 1 to 3 percent**Typical Pedon**

Atterberry silt loam, 1 to 3 percent slopes, in a cultivated field, 850 feet west and 2,300 feet north of the southeast corner of sec. 30, T. 97 N., R. 4 W.; U.S.G.S. Waterville, Iowa, Topographic Quadrangle; latitude 91 degrees, 21 minutes, and 8 seconds N. and longitude 43 degrees, 11 minutes, and 20 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine and few fine roots; neutral; abrupt smooth boundary.

E—9 to 17 inches; grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) silt loam; few discontinuous dark gray (10YR 4/1) coatings on

faces of peds; few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate thin platy structure; friable; few patchy gray or light gray (10YR 6/1) and light brownish gray (10YR 6/2 dry) silt coatings on faces of peds; few very fine roots; neutral; clear smooth boundary.

EB—17 to 25 inches; grayish brown (10YR 5/2) silt loam; few fine distinct dark yellowish brown (10YR 4/4) mottles; weak thin platy structure parting to weak very fine subangular blocky; friable; patchy gray or light gray (10YR 6/1) silt coatings on faces of peds; few very fine roots; medium acid; clear smooth boundary.

Btg1—25 to 34 inches; dark brown or brown (10YR 4/3) silt loam; few fine distinct grayish brown (10YR 5/2) and common fine distinct dark yellowish brown (10YR 4/6) mottles; moderate medium and fine subangular blocky structure; friable; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; patchy gray or light gray (10YR 6/1) silt coatings on faces of peds; few fine and few very fine roots; few dark concretions (iron and manganese oxides); strongly acid; clear smooth boundary.

Btg2—34 to 43 inches; dark brown or brown (10YR 4/3) silty clay loam; common fine distinct grayish brown (10YR 5/2) and few fine distinct dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few very fine and few fine roots; few dark concretions (iron and manganese oxides); strongly acid; clear smooth boundary.

BC—43 to 51 inches; dark brown or brown (10YR 4/3) silty clay loam; few fine distinct grayish brown (10YR 5/2) and few fine distinct strong brown (7.5YR 5/8) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; friable; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few very fine roots; common dark concretions (iron and manganese oxides); strongly acid; clear smooth boundary.

C—51 to 60 inches; dark brown or brown (10YR 4/3) silt loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; friable; few very fine roots; common dark concretions (iron and manganese oxides); strongly acid.

**Range in Characteristics****Depth to carbonates:** Greater than 60 inches**Depth to bedrock:** Greater than 60 inches

**Ap horizon:**

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

**E horizon:**

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

**Btg horizon:**

Hue—10YR or 2.5Y  
 Value—4 or 5  
 Chroma—2 to 4  
 Texture—silty clay loam or silt loam

**C horizon:**

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

## 291—Atterberry silt loam, 1 to 3 percent slopes

### Composition

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

### Setting

*Landform:* Interfluves  
*Position on landform:* Summits of hills  
*Slope:* 1 to 3 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:* 1 to 3 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 13.4 inches (high)  
*Organic matter content in 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

- Muscatine 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

### Bertrand Series

*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landscape:* Stream terraces  
*Landform:* Terraces  
*Geomorphic component:* Treads and risers  
*Parent material:* Silty alluvium over sand and gravel  
*Native vegetation:* Deciduous trees  
*Slope range:* 2 to 35 percent

### Typical Pedon

Bertrand silt loam, 2 to 5 percent slopes, in a cultivated field, 570 feet north and 1,280 feet west of the southeast corner of sec. 27, T. 100 N., R. 5 W.; U.S.G.S. Waukon Northwest, Iowa, Topographic Quadrangle; latitude 91 degrees, 24 minutes, and 57 seconds N. and longitude 43 degrees, 26 minutes, and 38 seconds W.

- Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; about 5 percent dark yellowish brown (10YR 4/4) mixings; weak fine and medium subangular blocky structure; friable; few very fine roots; neutral; abrupt smooth boundary.
- Bt1—10 to 16 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine and medium subangular blocky structure; friable; thin continuous dark brown (10YR 4/3) clay films on faces of peds; few very fine roots; slightly acid; clear smooth boundary.
- Bt2—16 to 20 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak fine and medium subangular blocky structure; friable; thin continuous dark brown (10YR 4/3) clay films on faces of peds; few small patches of silt coatings on faces of peds; few very fine roots; medium acid; clear smooth boundary.
- Bt3—20 to 27 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium angular blocky structure; friable; thin continuous dark brown (10YR 4/3) clay films on faces of peds; patchy silt

coatings on faces of peds; few very fine roots; medium acid; clear smooth boundary.

Bt4—27 to 32 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium prismatic structure parting to moderate medium and fine angular blocky; friable; thin continuous dark brown (10YR 4/3) clay films on faces of peds; patchy silt coatings on faces of peds; few very fine roots; medium acid; clear smooth boundary.

Bt5—32 to 39 inches; dark yellowish brown (10YR 4/4) silt loam; few medium prominent strong brown (7.5YR 5/6) and few medium prominent yellowish red (5YR 4/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; thin continuous dark brown (10YR 4/3) clay films on faces of peds; patchy silt coatings on faces of peds; few very fine roots; medium acid; gradual smooth boundary.

BCt—39 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; few medium prominent yellowish red (5YR 4/6) and common fine prominent strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; few thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; few patchy silt coatings on faces of peds; slightly acid.

#### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Ap or A horizon:*

Hue—10YR

Value—3 or 4

Chroma—2 or 3

Texture—silt loam

*Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—silt loam or silty clay loam

*C horizon:*

Hue—10YR

Value—3 to 5

Chroma—3 or 4

Texture—silt loam

### 793B—Bertrand silt loam, 2 to 5 percent slopes

#### Composition

Bertrand and similar soils: About 90 percent

Inclusions: About 10 percent

#### Setting

*Landform:* Terraces

*Slope:* 2 to 5 percent

#### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Silty alluvium over sand and gravel

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 12.3 inches (high)

*Organic matter content in 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 darker surface layer
- Areas of eroded 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

### 793C—Bertrand silt loam, 5 to 9 percent slopes

#### Composition

Bertrand and similar soils: About 90 percent

Inclusions: About 10 percent

#### Setting

*Landform:* Terraces

*Slope:* 5 to 9 percent

#### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Silty alluvium over sand and gravel

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 12.3 inches (high)

*Organic matter content in 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 darker surface layer
- Areas of eroded 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

### **793D2—Bertrand silt loam, 9 to 14 percent slopes, moderately eroded**

#### ***Composition***

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

#### ***Setting***

*Landform:* Terraces

*Slope:* 9 to 14 percent

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

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Silty alluvium over sand and gravel

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 12.3 inches (high)

*Organic matter content in 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 uneroded 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

### **793E—Bertrand silt loam, 14 to 18 percent slopes**

#### ***Composition***

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

#### ***Setting***

*Landform:* Terraces

*Slope:* 14 to 18 percent

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

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Silty alluvium over sand and gravel

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 12.3 inches (high)

*Organic matter content in 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 eroded 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

## 1793G—Bertrand-Chelsea complex, 18 to 35 percent slopes

### Composition

Bertrand and similar soils: About 60 percent  
Chelsea and similar soils: About 30 percent  
Inclusions: About 10 percent

### Setting

*Landform:* Terraces  
*Slope:* 18 to 35 percent

### Component Description

#### Bertrand

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* 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 12.3 inches (high)  
*Organic matter content in the surface layer:* About 2.5 percent (moderate)

#### Chelsea

*Surface layer texture:* Loamy sand  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Excessively 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 4.4 inches (low)  
*Organic matter content in 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

- Hawick 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

## Boone Series

*Drainage class:* Excessively drained  
*Permeability:* Rapid in the upper part, moderate or moderately slow in the lower part  
*Landscape:* Uplands  
*Landform:* Hills and scarps  
*Geomorphic component:* Side slopes and nose slopes  
*Hillslope position:* Shoulders and back slopes  
*Parent material:* Sandy residuum over sandstone bedrock  
*Native vegetation:* Deciduous trees  
*Slope range:* 9 to 70 percent

### Typical Pedon

Boone loamy sand, 25 to 40 percent slopes, in a wooded area, 1,200 feet east and 2,590 feet north of the southwest corner of sec. 22, T. 100 N., R. 6 W.; U.S.G.S. Dorchester, Iowa, Topographic Quadrangle; latitude 91 degrees, 32 minutes, and 47 seconds N. and longitude 43 degrees, 27 minutes, and 42 seconds W.

A1—0 to 4 inches; black (10YR 2/1) loamy sand, gray (10YR 5/1) dry; weak fine and medium subangular blocky structure parting to weak fine granular; very friable; many fine and very fine roots; neutral; clear smooth boundary.

A2—4 to 6 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; black (10YR 2/1) coatings on faces of peds; weak medium and fine subangular blocky structure; very friable; common very fine and fine roots; neutral; clear smooth boundary.

Bw1—6 to 10 inches; dark brown (10YR 4/3) loamy sand; very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium and fine subangular blocky structure; very friable; few fine and very fine roots; neutral; clear smooth boundary.

Bw2—10 to 16 inches; dark brown (10YR 4/3) loamy sand; few very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium and fine subangular blocky structure; very friable; few very fine and fine roots; slightly acid; gradual smooth boundary.

C—16 to 24 inches; dark brown (10YR 4/3) sand; single grained; loose; few very fine roots; slightly acid; abrupt wavy boundary.

Cr—24 inches; sandstone bedrock.

### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to paralithic contact:* 20 to 40 inches

*A horizon:*

Hue—10YR  
Value—2 or 3  
Chroma—1 or 2  
Texture—loamy sand

*C horizon:*

Hue—10YR  
Value—4 or 5  
Chroma—3 or 4  
Texture—loamy sand or sand

**210E—Boone loamy sand, 9 to 18 percent slopes**

***Composition***

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

***Setting***

*Landform:* Hills  
*Position on landform:* Head slopes, nose slopes, and side slopes  
*Slope:* 9 to 18 percent

***Component Description***

*Surface layer texture:* Loamy sand  
*Depth to bedrock:* 20 to 40 inches  
*Drainage class:* Excessively drained  
*Dominant parent material:* Sandstone  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 2.0 inches (very low)  
*Organic matter content in the surface layer:* About 1 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***

- Soils that have a surface layer of loam

***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

**210F—Boone loamy sand, 18 to 25 percent slopes**

***Composition***

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

***Setting***

*Landform:* Hills  
*Position on landform:* Head slopes, nose slopes, and side slopes  
*Slope:* 18 to 25 percent

***Component Description***

*Surface layer texture:* Loamy sand  
*Depth to bedrock:* 20 to 40 inches  
*Drainage class:* Excessively drained  
*Dominant parent material:* Sandstone  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 2.0 inches (very low)  
*Organic matter content in the surface layer:* About 1 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***

- Soils that have a surface layer of loam

***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

**210G—Boone loamy sand, 25 to 40 percent slopes**

***Composition***

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

***Setting***

*Landform:* Hills  
*Position on landform:* Head slopes, nose slopes, and side slopes  
*Slope:* 25 to 40 percent

### Component Description

*Surface layer texture:* Loamy sand  
*Depth to bedrock:* 20 to 40 inches  
*Drainage class:* Excessively drained  
*Dominant parent material:* Sandstone  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 2.0 inches (very low)  
*Organic matter content in the surface layer:* About 1 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

- Sandstone bedrock outcrops

### 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

### Caneek Series

*Drainage class:* Poorly drained  
*Permeability:* Moderate  
*Landscape:* Flood plains  
*Landform:* Flood plains  
*Parent material:* Alluvium  
*Native vegetation:* Prairie grasses with scattered trees  
*Slope range:* 0 to 2 percent

### Typical Pedon

Caneek silt loam, channeled, 0 to 2 percent slopes, in a wooded area on bottom land, 1,200 feet north and 2,200 feet west of the southeast corner of sec. 7, T. 97 N., R. 2 W.; U.S.G.S. Eastman, Wisconsin, Topographic Quadrangle—Iowa; latitude 91 degrees, 7 minutes, and 11 seconds N. and longitude 43 degrees, 13 minutes, and 43 seconds W.

A—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; few fine distinct dark brown (7.5YR 3/4) and few fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; friable; common medium and common fine roots; mildly alkaline; clear smooth boundary.

C1—9 to 19 inches; stratified dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam; few fine distinct dark yellowish brown (10YR 4/4) and few fine distinct dark yellowish brown (10YR 4/6) mottles; massive with horizontal cleavage resulting from stratification; friable; few medium and few fine roots; slight effervescence; mildly alkaline; clear smooth boundary.

C2—19 to 31 inches; stratified grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) silt loam; few fine distinct dark yellowish brown (10YR 4/4 and 4/6) and dark brown (7.5YR 3/2) mottles; massive with horizontal cleavage resulting from stratification; friable; few fine roots; slight effervescence; mildly alkaline; abrupt smooth boundary.

Ab1—31 to 49 inches; very dark gray (10YR 3/1) silt loam; common fine distinct strong brown (7.5YR 4/6) mottles; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots; neutral; gradual smooth boundary.

Ab2—49 to 60 inches; very dark gray (N 3/0) silt loam; few fine distinct strong brown (7.5YR 4/6) mottles; weak very fine and fine subangular blocky structure; friable; few fine roots; neutral.

### Range in Characteristics

*Depth to carbonates:* 0 to 10 inches  
*Depth to bedrock:* Greater than 60 inches  
*Depth to Ab horizon:* 20 to 40 inches

#### A horizon:

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

#### C horizon:

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

#### Ab horizon:

Hue—10YR, 2.5Y, or neutral  
 Value—2 or 3  
 Chroma—0 or 1  
 Texture—silt loam or silty clay loam

### 490—Caneek silt loam, 0 to 2 percent slopes

#### Composition

Caneek 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:* Calcareous alluvium

*Flooding:* Frequent

*Seasonal high water table:* At the surface to 1 foot below the surface

*Available water capacity to 60 inches or root-limiting layer:* About 13.2 inches (high)

*Organic matter content in the surface layer:* About 1.2 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**

- Arenzville 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

## **1490—Caneek silt loam, channeled, 0 to 2 percent slopes**

### **Composition**

Caneek 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:* Calcareous alluvium

*Flooding:* Frequent

*Seasonal high water table:* At the surface to 1 foot below the surface

*Available water capacity to 60 inches or root-limiting layer:* About 13.2 inches (high)

*Organic matter content in the surface layer:* About 1.2 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**

- Soils that have a surface layer of loamy sand or sandy loam

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

- Pasture

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

- Agronomy section

## **Chaseburg Series**

*Drainage class:* Well drained

*Permeability:* Moderate

*Landscape:* Flood plains and uplands

*Landform:* Flood plains and drainageways

*Parent material:* Alluvium

*Native vegetation:* Prairie grasses with scattered trees

*Slope range:* 0 to 5 percent

### **Typical Pedon**

Chaseburg silt loam, 0 to 2 percent slopes, in a pasture, 380 feet east and 420 feet north of the southwest corner of sec. 19, T. 96 N., R. 5 W.; U.S.G.S. Monona, Iowa, Topographic Quadrangle; latitude 91 degrees, 29 minutes, and 13 seconds N. and longitude 43 degrees, 6 minutes, and 43 seconds W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine and very fine subangular blocky structure; friable; few very fine roots; mildly alkaline; clear smooth boundary.

AC—7 to 18 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak thin platy structure parting to weak very fine subangular blocky; friable; few very fine roots; mildly alkaline; abrupt smooth boundary.

C1—18 to 31 inches; stratified grayish brown (10YR 5/2), dark grayish brown (10YR 4/2), and very dark grayish brown (10YR 3/2) silt loam; massive with horizontal cleavage resulting from stratification; friable; few very fine roots; mildly alkaline; gradual smooth boundary.

C2—31 to 43 inches; stratified dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), very dark



grayish brown (10YR 3/2), and very dark gray (10YR 3/1) silt loam; massive with horizontal cleavage resulting from stratification; friable; few very fine roots; neutral; abrupt smooth boundary.

Ab—43 to 54 inches; very dark gray (10YR 3/1) silt loam; weak medium subangular blocky structure parting to weak fine granular; friable; neutral; clear smooth boundary.

ABb—54 to 60 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine subangular blocky structure; friable; neutral.

#### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Depth to Ab horizon:* Greater than 40 inches

*Ap horizon:*

Hue—10YR

Value—3 or 4

Chroma—2

Texture—silt loam

*C horizon:*

Hue—10YR

Value—3 to 5

Chroma—1 to 3

Texture—silt loam

*Ab horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam or silty clay loam

## 142—Chaseburg silt loam, 0 to 2 percent slopes

### Composition

Chaseburg 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:* Well drained

*Flooding:* Occasional

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

*Available water capacity to 60 inches or root-limiting layer:* About 12.5 inches (high)

*Organic matter content in 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

- Ion 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

## Chelsea Series

*Drainage class:* Excessively drained

*Permeability:* Rapid

*Landscape:* Stream terraces

*Landform:* Terraces

*Geomorphic component:* Treads and risers

*Parent material:* Eolian and alluvial sandy sediment

*Native vegetation:* Oak-hickory forest

*Slope range:* 2 to 45 percent

### Typical Pedon

Chelsea loamy sand, 5 to 9 percent slopes, in a forested area, 2,160 feet east and 1,400 feet south of the northwest corner of sec. 26, T. 100 N., R. 4 W.; U.S.G.S. New Albin, Iowa, Topographic Quadrangle; latitude 91 degrees, 17 minutes, and 0 seconds N. and longitude 43 degrees, 27 minutes, and 12 seconds W.

A1—0 to 1 inch; black (10YR 2/1) loamy sand, gray (10YR 5/1) dry; weak fine granular structure; very friable; very strongly acid; many and common fine and very fine roots; clear smooth boundary.

A2—1 to 3 inches; very dark gray (10YR 3/1) loamy sand, grayish brown (10YR 5/2) dry; weak fine and medium subangular blocky structure; very friable; common fine and very fine roots; very strongly acid; gradual smooth boundary.

E1—3 to 6 inches; dark grayish brown (10YR 4/2) loamy sand; weak medium subangular blocky structure; very friable; common fine and very fine roots; very strongly acid; gradual smooth boundary.

E2—6 to 11 inches; brown (10YR 4/3) loamy sand; weak medium and coarse subangular blocky structure; very friable; few fine and very fine roots;

very strongly acid; gradual smooth boundary.

E3—11 to 35 inches; yellowish brown (10YR 5/6) loamy sand; weak coarse subangular blocky structure; very friable; strongly acid; gradual smooth boundary.

E and Bt—35 to 60 inches; yellowish brown (10YR 5/6) sand; single grained; loose; few lamellae of strong brown (7.5YR 5/6) loamy sand ½ inch to 2 inches thick; strongly acid.

#### **Range in Characteristics**

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—loamy sand

*Ap horizon (in cultivated areas):*

Hue—10YR

Value—3 or 4

Chroma—2

Texture—loamy sand

*E horizon:*

Hue—10YR

Value—4 or 5

Chroma—2 to 6

Texture—loamy sand

*E and Bt horizon:*

Hue—10YR or 7.5YR

Value—4 to 6

Chroma—4 to 6

Texture—sand or loamy sand

### **63B—Chelsea loamy sand, 2 to 5 percent slopes**

#### **Composition**

Chelsea and similar soils: About 95 percent

Inclusions: About 5 percent

#### **Setting**

*Landform:* Terraces

*Slope:* 2 to 5 percent

#### **Component Description**

*Surface layer texture:* Loamy sand

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Excessively drained

*Dominant parent material:* Eolian sand

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting*

*layer:* About 4.4 inches (low)

*Organic matter content in the surface layer:* About 1 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**

- Soils that have a thicker and darker surface layer

#### **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

### **63C—Chelsea loamy sand, 5 to 9 percent slopes**

#### **Composition**

Chelsea and similar soils: About 95 percent

Inclusions: About 5 percent

#### **Setting**

*Landform:* Terraces

*Slope:* 5 to 9 percent

#### **Component Description**

*Surface layer texture:* Loamy sand

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Excessively drained

*Dominant parent material:* Eolian sand

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 4.4 inches (low)

*Organic matter content in the surface layer:* About 1 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**

- Soils that have a thinner and lighter colored surface layer

**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

**63D—Chelsea loamy sand, 9 to 14 percent slopes****Composition**

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

**Setting**

*Landform:* Terraces  
*Slope:* 9 to 14 percent

**Component Description**

*Surface layer texture:* Loamy sand  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Excessively drained  
*Dominant parent material:* Eolian sand  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 4.4 inches (low)  
*Organic matter content in the surface layer:* About 1 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**

- Soils that have a thinner and lighter colored surface layer

**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

**63E—Chelsea loamy sand, 14 to 18 percent slopes****Composition**

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

**Setting**

*Landform:* Terraces  
*Slope:* 14 to 18 percent

**Component Description**

*Surface layer texture:* Loamy sand  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Excessively drained  
*Dominant parent material:* Eolian sand  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 4.4 inches (low)  
*Organic matter content in the surface layer:* About 1 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**

- Soils that have a substratum of silt loam
- Areas of eroded 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

**63F—Chelsea loamy sand, 18 to 25 percent slopes****Composition**

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

**Setting**

*Landform:* Terraces  
*Slope:* 18 to 25 percent

**Component Description**

*Surface layer texture:* Loamy sand  
*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Excessively drained  
*Dominant parent material:* Eolian sand  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 4.4 inches (low)  
*Organic matter content in the surface layer:* About 1 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**

- Soils that have a substratum of silt loam

#### **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

### **63G—Chelsea loamy sand, 25 to 45 percent slopes**

#### **Composition**

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

#### **Setting**

*Landform:* Terraces  
*Slope:* 25 to 45 percent

#### **Component Description**

*Surface layer texture:* Loamy sand  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Excessively drained  
*Dominant parent material:* Eolian sand  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 4.4 inches (low)  
*Organic matter content in the surface layer:* About 1 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**

- Soils that have a substratum of silt loam

#### **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

### **Churchtown Series**

*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landscape:* Uplands  
*Landform:* Hills  
*Geomorphic component:* Base slopes  
*Hillslope position:* Foot slopes  
*Parent material:* Slope alluvium  
*Native vegetation:* Prairie grasses and deciduous trees  
*Slope range:* 9 to 25 percent

#### **Typical Pedon**

Churchtown loam, 14 to 18 percent slopes, in a cultivated field, 2,000 feet east and 1,600 feet south of the northwest corner of sec. 2, T. 98 N., R. 6 W.; U.S.G.S. Hanover, Iowa, Topographic Quadrangle; latitude 91 degrees, 31 minutes, and 9 seconds N. and longitude 43 degrees, 20 minutes, and 15 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam (52 percent sand), grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—9 to 17 inches; brown (10YR 4/3) silt loam (22 percent sand); moderate fine subangular blocky structure; friable; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; few thin discontinuous light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine roots; neutral; gradual smooth boundary.

Bt2—17 to 24 inches; dark yellowish brown (10YR 4/4) silty clay loam (12 percent sand); moderate fine and medium subangular blocky structure; friable; thin continuous dark brown (10YR 3/3) clay films on faces of peds; few thin discontinuous light gray (10YR 7/2 dry) silt coatings on faces of peds; few very fine roots; neutral; clear smooth boundary.

Bt3—24 to 30 inches; dark yellowish brown (10YR 4/4) silty clay loam (14 percent sand); weak medium prismatic structure parting to weak medium subangular blocky; friable; thin discontinuous brown

(10YR 4/3) clay films on faces of peds; common thin discontinuous light gray (10YR 7/2 dry) silt coatings on faces of peds; few discontinuous dark brown (10YR 3/3) organic coatings on faces of peds; few very fine roots; neutral; clear smooth boundary.

2Bt4—30 to 44 inches; dark yellowish brown (10YR 4/4) silt loam (10 percent sand); weak medium prismatic structure; friable; thin discontinuous brown and dark brown (10YR 4/3) clay films on faces of peds; few thin discontinuous light gray (10YR 7/2 dry) silt coatings on faces of peds; few discontinuous dark brown (10YR 3/3) organic coatings on faces of peds; few very fine roots; neutral; gradual smooth boundary.

2Bt5—44 to 60 inches; yellowish brown (10YR 5/4) silt loam (10 percent sand); weak medium prismatic structure; friable; thin discontinuous brown and dark brown (10YR 4/3) clay films on faces of peds; very few thin discontinuous light gray (10YR 7/2) silt coatings on faces of peds; few discontinuous dark brown (10YR 3/3) organic coatings on faces of peds; neutral.

#### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Thickness of loamy sediments:* 20 to 48 inches

*Percent sand in loamy sediments:* 10 to 55 percent

*A or Ap horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 to 3

Texture—loam

*E horizon (if it occurs):*

Hue—10YR

Value—3 or 4

Chroma—2

Texture—loam or silt loam high in content of sand (20 to 40 percent)

*Bt and 2Bt horizons:*

Hue—10YR

Value—4 or 5

Chroma—3 to 6

Texture—silt loam or silty clay loam

*2C horizon (if it occurs):*

Hue—10YR

Value—4 to 6

Chroma—4 to 6

Texture—silt loam

## 862D—Churchtown loam, 9 to 14 percent slopes

### Composition

Churchtown and similar soils: About 90 percent

Inclusions: About 10 percent

### Setting

*Landform:* Hills

*Position on landform:* Back slopes and foot slopes

*Slope:* 9 to 14 percent

### Component Description

*Surface layer texture:* Loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Slope alluvium

*Flooding:* None

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

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

*Organic matter content in 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 eroded soils
- Soils that have a surface layer of sandy loam

### 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

## 862D2—Churchtown loam, 9 to 14 percent slopes, moderately eroded

### Composition

Churchtown and similar soils: About 90 percent

Inclusions: About 10 percent

### Setting

*Landform:* Hills

*Position on landform:* Back slopes and foot slopes

*Slope:* 9 to 14 percent

### **Component Description**

*Surface layer texture:* Loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Slope alluvium

*Flooding:* None

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

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

*Organic matter content in 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 uneroded soils
- Soils that have a surface layer of sandy loam

### **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

## **862E—Churchtown loam, 14 to 18 percent slopes**

### **Composition**

Churchtown and similar soils: About 85 percent

Inclusions: About 15 percent

### **Setting**

*Landform:* Hills

*Position on landform:* Back slopes and foot slopes

*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:* Slope alluvium

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting*

*layer:* About 11.7 inches (high)

*Organic matter content in 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 eroded soils
- Yellowriver and similar soils
- Soils that have a surface layer of sandy loam

### **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

## **862E2—Churchtown loam, 14 to 18 percent slopes, moderately eroded**

### **Composition**

Churchtown and similar soils: About 85 percent

Inclusions: About 15 percent

### **Setting**

*Landform:* Hills

*Position on landform:* Back slopes and foot slopes

*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:* Slope alluvium

*Flooding:* None

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

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

*Organic matter content in 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 uneroded soils
- Soils that have a surface layer of sandy loam
- Areas of severely eroded 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

**862F—Churchtown loam, 18 to 25 percent slopes****Composition**

Churchtown and similar soils: About 90 percent

Inclusions: About 10 percent

**Setting**

*Landform:* Hills

*Position on landform:* Back slopes and foot slopes

*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:* Slope alluvium

*Flooding:* None

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

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

*Organic matter content in 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 eroded soils
- Soils that have a surface layer of sandy loam

**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

**Downs Series**

*Drainage class:* Well drained

*Permeability:* Moderate

*Landscape:* Uplands

*Landform:* Hills

*Geomorphic component:* Divides, interfluves, side slopes, and head slopes

*Hillslope position:* Summits, shoulders, and back slopes

*Parent material:* Loess

*Native vegetation:* Mixed prairie grasses and trees

*Slope range:* 2 to 18 percent

**Typical Pedon**

Downs silt loam, 2 to 5 percent slopes, in a cultivated field, 2,620 feet north and 765 feet east of the southwest corner of sec. 7, T. 100 N., R. 6 W.; U.S.G.S. Dorchester, Iowa, Topographic Quadrangle; latitude 91 degrees, 36 minutes, and 27 seconds N. and longitude 43 degrees, 29 minutes, and 36 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with few (less than 2 percent) pockets and streaks of brown (10YR 4/3) subsurface material; weak fine subangular blocky structure; friable; few very fine roots; neutral; abrupt smooth boundary.

Bt1—9 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; few dark organic stains on faces of peds; few very fine roots; neutral; clear smooth boundary.

Bt2—15 to 29 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium and fine subangular and angular blocky structure; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; patchy light gray (10YR 6/1 dry) silt coatings on faces of peds; few dark organic stains on faces of peds; few very fine roots; medium acid; gradual smooth boundary.

Bt3—29 to 40 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium prismatic structure parting to moderate medium and fine subangular blocky; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; patchy light gray (10YR 6/1 dry) silt coatings on faces of peds; few dark organic stains on faces of peds; few very fine roots; medium acid; clear smooth boundary.

Bt4—40 to 46 inches; yellowish brown (10YR 5/4) silty

clay loam; moderate coarse prismatic structure parting to weak medium and fine subangular blocky; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; patchy light gray (10YR 6/1 dry) silt coatings on faces of peds; few very fine roots; medium acid; gradual smooth boundary.

BC—46 to 56 inches; yellowish brown (10YR 5/4) silty clay loam; moderate coarse prismatic structure; friable; thin continuous brown (10YR 4/3) coatings on vertical faces of peds; few fine distinct strong brown (7.5YR 5/6) mottles; few very fine roots; few dark concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

C—56 to 60 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct strong brown (7.5YR 5/6) mottles; massive; friable; few very fine roots; few dark concretions (iron and manganese oxides); slightly acid.

#### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Ap horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

*Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 to 6

Texture—silty clay loam

*C horizon:*

Hue—10YR

Value—4 to 6

Chroma—3 to 6

Texture—silt loam

### 162B—Downs silt loam, 2 to 5 percent slopes

#### Composition

Downs and similar soils: About 90 percent

Inclusions: About 10 percent

#### Setting

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 2 to 5 percent

#### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

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

*Organic matter content in 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

- Soils that have a thinner and lighter colored surface layer

#### 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

### 162B2—Downs silt loam, 2 to 5 percent slopes, moderately eroded

#### Composition

Downs and similar soils: About 85 percent

Inclusions: About 15 percent

#### Setting

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 2 to 5 percent

#### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

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

*Organic matter content in 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***

- Tama and similar soils
- Fayette 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

## **162C—Downs silt loam, 5 to 9 percent slopes**

### ***Composition***

Downs and similar soils: About 85 percent  
Inclusions: About 15 percent

### ***Setting***

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 5 to 9 percent

### ***Component Description***

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

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

*Organic matter content in 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***

- Allamakee and similar soils
- Frankville and similar soils
- Areas of eroded 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

## **162C2—Downs silt loam, 5 to 9 percent slopes, moderately eroded**

### ***Composition***

Downs and similar soils: About 85 percent  
Inclusions: About 15 percent

### ***Setting***

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 5 to 9 percent

### ***Component Description***

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

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

*Organic matter content in 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***

- Allamakee and similar soils
- Frankville and similar soils
- Areas of uneroded 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

### 162D—Downs silt loam, 9 to 14 percent slopes

#### **Composition**

Downs and similar soils: About 85 percent  
Inclusions: About 15 percent

#### **Setting**

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 9 to 14 percent

#### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

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

*Organic matter content in 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**

- Allamakee and similar soils
- Frankville and similar soils
- Areas of eroded 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

### 162D2—Downs silt loam, 9 to 14 percent slopes, moderately eroded

#### **Composition**

Downs and similar soils: About 85 percent  
Inclusions: About 15 percent

#### **Setting**

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 9 to 14 percent

#### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

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

*Organic matter content in 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**

- Allamakee and similar soils
- Frankville and similar soils
- Areas of uneroded 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

### 162E2—Downs silt loam, 14 to 18 percent slopes, moderately eroded

#### **Composition**

Downs and similar soils: About 85 percent  
Inclusions: About 15 percent

#### **Setting**

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 14 to 18 percent

#### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 11.7 inches (high)  
*Organic matter content in 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***

- Allamakee and similar soils
- Frankville and similar soils
- Areas of severely eroded 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

## ***Dubuque Series***

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Landscape:* Uplands

*Landform:* Hills

*Geomorphic component:* Side slopes and nose slopes

*Hillslope position:* Shoulders and back slopes

*Parent material:* Loess and a thin layer of clayey residuum over limestone bedrock

*Native vegetation:* Deciduous trees

*Slope range:* 5 to 25 percent

### ***Typical Pedon***

Dubuque silt loam, 5 to 9 percent slopes, in a wooded pasture, 1,060 feet north and 640 feet east of the center of sec. 16, T. 98 N., R. 5 W.; U.S.G.S. Waukon, Iowa, Topographic Quadrangle; latitude 91 degrees, 26 minutes, and 5 seconds N. and longitude 43 degrees, 18 minutes, and 29 seconds W.

A—0 to 3 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; many fine roots; neutral; abrupt smooth boundary.

E—3 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak thick and thin platy structure; friable;

few fine and common medium roots; slightly acid; clear smooth boundary.

BE—7 to 12 inches; brown (10YR 4/3) silt loam; weak fine and medium subangular blocky structure; friable; few fine and medium roots; medium acid; clear smooth boundary.

Bt1—12 to 16 inches; yellowish brown (10YR 4/4) silty clay loam; weak fine and medium subangular blocky structure; friable; few fine and medium roots; few grayish silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt2—16 to 24 inches; dark yellowish brown (10YR 4/6) silty clay loam; moderate fine and very fine angular blocky structure; firm; dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine and medium roots; medium acid; clear smooth boundary.

Bt3—24 to 27 inches; dark yellowish brown (10YR 4/6) silty clay loam; weak medium and fine prismatic structure parting to moderate medium and fine subangular blocky; firm; dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine and medium roots; medium acid; abrupt smooth boundary.

2Bt4—27 to 28 inches; dark yellowish brown (10YR 3/4) silty clay; moderate medium and fine subangular blocky structure; firm; few fine and medium roots; common limestone fragments ½ to 1 inch in diameter; mildly alkaline; abrupt wavy boundary.

2R—28 to 60 inches; fractured limestone bedrock.

### ***Range in Characteristics***

*Depth to carbonates:* 20 to 40 inches

*Depth to bedrock:* 20 to 40 inches

*A horizon:*

Hue—10YR

Value—3

Chroma—1 or 2

Texture—silt loam

*Ap horizon (if it occurs):*

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—silt loam

*E horizon:*

Hue—10YR

Value—4 or 5

Chroma—2

Texture—silt loam

*Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 to 6  
Texture—silty clay loam

**2Bt horizon:**

Hue—10YR, 7.5YR, or 5YR  
Value—3 to 6  
Chroma—3 to 6  
Texture—silty clay or clay

**703C—Dubuque silt loam, 5 to 9 percent slopes****Composition**

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

**Setting**

*Landform:* Hills  
*Position on landform:* Head slopes, nose slopes, and side slopes  
*Slope:* 5 to 9 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* 20 to 30 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Loess over limestone  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 5.4 inches (low)  
*Organic matter content in 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**

- Frankville and similar soils
- Soils that have bedrock at a depth of more than 40 inches

**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

**703C2—Dubuque silt loam, 5 to 9 percent slopes, moderately eroded****Composition**

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

**Setting**

*Landform:* Hills  
*Position on landform:* Head slopes, nose slopes, and side slopes  
*Slope:* 5 to 9 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* 20 to 30 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Loess over limestone  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 4.9 inches (low)  
*Organic matter content in 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 severely eroded 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

**703D—Dubuque silt loam, 9 to 14 percent slopes****Composition**

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

**Setting**

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 9 to 14 percent

### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* 20 to 30 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over limestone

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 5.4 inches (low)

*Organic matter content in 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 eroded 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

## **703D2—Dubuque silt loam, 9 to 14 percent slopes, moderately eroded**

### **Composition**

Dubuque and similar soils: About 90 percent

Inclusions: About 10 percent

### **Setting**

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 9 to 14 percent

### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* 20 to 30 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over limestone

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 4.9 inches (low)

*Organic matter content in 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 severely eroded soils
- Soils that have bedrock at a depth of more than 40 inches

### **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

## **703E—Dubuque silt loam, 14 to 18 percent slopes**

### **Composition**

Dubuque and similar soils: About 90 percent

Inclusions: About 10 percent

### **Setting**

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 14 to 18 percent

### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* 20 to 30 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over limestone

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 5.4 inches (low)

*Organic matter content in 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***

- Nordness and similar soils
- Areas of eroded 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

### **703E2—Dubuque silt loam, 14 to 18 percent slopes, moderately eroded**

#### ***Composition***

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

#### ***Setting***

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 14 to 18 percent

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

*Surface layer texture:* Silt loam

*Depth to bedrock:* 20 to 30 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over limestone

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 4.9 inches (low)

*Organic matter content in 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***

- Nordness and similar soils
- Areas of severely eroded 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

### **703F—Dubuque silt loam, 18 to 25 percent slopes**

#### ***Composition***

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

#### ***Setting***

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 18 to 25 percent

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

*Surface layer texture:* Silt loam

*Depth to bedrock:* 20 to 30 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over limestone

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 5.4 inches (low)

*Organic matter content in 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***

- Nordness and similar soils
- Limestone bedrock outcrops

#### ***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

### ***Eitzen Series***

*Drainage class:* Moderately well drained

*Permeability:* Moderate

*Landscape:* Flood plains and uplands

*Landform:* Flood plains and drainageways

*Parent material:* Alluvium

*Native vegetation:* Prairie grasses

*Slope range:* 0 to 5 percent

### Typical Pedon

Eitzen silt loam, 0 to 2 percent slopes, in a cultivated field, 540 feet west and 50 feet south of the northeast corner of sec. 14, T. 97 N., R. 5 W.; U.S.G.S. Rossville, Iowa, Topographic Quadrangle; latitude 91 degrees, 23 minutes, and 30 seconds N. and longitude 43 degrees, 13 minutes, and 32 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

C—9 to 30 inches; stratified very dark grayish brown (10YR 3/2), dark brown (10YR 3/3), and grayish brown (10YR 5/2) silt loam; massive with horizontal cleavage resulting from stratification; friable; few very fine roots; neutral; abrupt smooth boundary.

Ab1—30 to 37 inches; black (10YR 2/1) silt loam; weak fine and very fine subangular blocky structure; friable; few very fine roots; neutral; gradual smooth boundary.

Ab2—37 to 47 inches; very dark gray (10YR 3/1) and black (10YR 2/1) silt loam; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Ab3—47 to 53 inches; very dark grayish brown (10YR 3/2) silt loam; very dark gray (10YR 3/1) coatings on faces of peds; few streaks and pockets of dark brown (10YR 4/3); weak fine and medium subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Bwb—53 to 60 inches; dark brown (10YR 4/3) silt loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium prismatic structure parting to moderate medium and fine subangular blocky; friable; few very fine roots; neutral.

### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Depth to Ab horizon:* 20 to 36 inches

*Ap horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 to 3

Texture—silt loam

*C horizon:*

Hue—10YR

Value—dominantly 2 or 3; 3 to 5 in strata

Chroma—1 to 3

Texture—silt loam

*Ab horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

*Bwb horizon:*

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—3 or 4

Texture—silt loam

## 85—Eitzen silt loam, 0 to 2 percent slopes

### Composition

Eitzen 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:* Moderately well drained

*Flooding:* Occasional

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

*Available water capacity to 60 inches or root-limiting layer:* About 13.1 inches (high)

*Organic matter content in 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

- Orion 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

**85B—Eitzen silt loam, 2 to 5 percent slopes****Composition**

Eitzen and similar soils: About 95 percent

Inclusions: About 5 percent

**Setting**

*Landform:* Drainageways

*Slope:* 2 to 5 percent

**Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Moderately well drained

*Flooding:* Occasional

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

*Available water capacity to 60 inches or root-limiting layer:* About 13.1 inches (high)

*Organic matter content in 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**

- Orion and similar soils
- Volney 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

**Elon Series**

*Drainage class:* Somewhat poorly drained

*Permeability:* Moderate

*Landscape:* Flood plains

*Landform:* Flood plains

*Parent material:* Alluvium

*Native vegetation:* Prairie grasses

*Slope range:* 0 to 2 percent

**Typical Pedon**

Elon silt loam, 0 to 2 percent slopes, in a cultivated field, 1,550 feet north and 2,600 feet east of the southwest corner of sec. 13, T. 96 N., R. 5 W.; U.S.G.S. Rossville, Iowa, Topographic Quadrangle; latitude 91 degrees, 22 minutes, and 48 seconds N. and

longitude 43 degrees, 7 minutes, and 13 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine and very fine subangular blocky structure; friable; few very fine roots; strong effervescence; moderately alkaline; clear smooth boundary.

C1—9 to 16 inches; stratified very dark gray (10YR 3/1), dark grayish brown (10YR 4/2), and very dark grayish brown (10YR 3/2) silt loam; common medium distinct dark brown (7.5YR 3/4) mottles; massive with horizontal cleavage resulting from stratification; friable; common very fine roots; strong effervescence; moderately alkaline; clear smooth boundary.

C2—16 to 38 inches; stratified very dark grayish brown (10YR 3/2), very dark gray (10YR 3/1), dark grayish brown (10YR 4/2), and grayish brown (10YR 5/2) silt loam; few fine distinct dark brown (7.5YR 3/4) mottles; massive with horizontal cleavage resulting from stratification; friable; few very fine roots in the upper part; strong effervescence; moderately alkaline; clear smooth boundary.

C3—38 to 50 inches; stratified dark gray (10YR 4/1), very dark gray (10YR 3/1), and grayish brown (10YR 5/2) silt loam; common fine distinct dark brown (7.5YR 3/4) mottles; massive with horizontal cleavage resulting from stratification; friable; mildly alkaline; abrupt smooth boundary.

C4—50 to 53 inches; stratified very dark gray (10YR 3/1), dark gray (10YR 4/1), black (10YR 2/1), and grayish brown (2.5Y 5/2) silt loam; common medium distinct dark brown (7.5YR 3/4) mottles; massive with horizontal cleavage resulting from stratification; friable; mildly alkaline; abrupt smooth boundary.

C5—53 to 60 inches; stratified dark gray (10YR 4/1) and grayish brown (2.5Y 5/2) silt loam; common medium distinct dark brown (7.5YR 3/4) mottles; massive with horizontal cleavage resulting from stratification; friable; neutral.

**Range in Characteristics**

*Depth to carbonates:* 0 to 10 inches

*Depth to bedrock:* Greater than 60 inches

*Ap or A horizon:*

Hue—10YR

Value—3

Chroma—1 or 2

Texture—silt loam

*C horizon:*

Hue—10YR or 2.5Y

Value—2 to 5

Chroma—1 to 3

Texture—silt loam



**843—Elon silt loam, 0 to 2 percent slopes****Composition**

Elon 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:* Somewhat poorly drained  
*Dominant parent material:* Calcareous alluvium  
*Flooding:* Occasional  
*Depth to the water table:* 2 to 4 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 12.6 inches (high)  
*Organic matter content in the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this character. 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 are noncalcareous to a depth of 40 inches

**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

**Fayette Series**

*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landscape:* Uplands  
*Landform:* Hills  
*Geomorphic component:* Divides, interfluves, side slopes, and head slopes  
*Hillslope position:* Summits, shoulders, and back slopes  
*Parent material:* Loess  
*Native vegetation:* Deciduous trees  
*Slope range:* 2 to 40 percent

**Typical Pedon**

Fayette silt loam, 2 to 5 percent slopes, in a wooded area, 2,080 feet east and 720 feet south of the northwest corner of sec. 6, T. 96 N., R. 3 W.; U.S.G.S. Harpers Ferry, Iowa, Topographic Quadrangle; latitude 91 degrees, 14 minutes, and 35 seconds N. and longitude 43 degrees, 10 minutes, and 5 seconds W.

- A—0 to 3 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine and very fine granular structure; friable; few medium and common very fine roots; neutral; clear smooth boundary.
- E1—3 to 8 inches; brown (10YR 5/3) silt loam, pale brown (10YR 6/3) dry; moderate thin platy structure; friable; few medium and few fine roots; neutral; clear smooth boundary.
- E2—8 to 10 inches; brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; few fine and few very fine roots; very strongly acid; clear smooth boundary.
- BE—10 to 13 inches; brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; patchy light gray (10YR 6/1 dry) silt coatings on faces of peds; few very fine roots; very strongly acid; clear smooth boundary.
- Bt1—13 to 17 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; thin continuous brown (10YR 4/3) clay films; patchy light gray (10YR 6/1 dry) silt coatings on faces of peds; few very fine roots; very strongly acid; gradual smooth boundary.
- Bt2—17 to 37 inches; dark yellowish brown (10YR 4/4) silty clay loam; coarse medium and fine subangular and angular blocky structure; friable; thin continuous brown (10YR 4/3) clay films; patchy light gray (10YR 6/1 dry) silt coatings on faces of peds; some dark organic stains on faces of peds; few fine and few very fine roots; strongly acid; gradual smooth boundary.
- BC—37 to 51 inches; yellowish brown (10YR 5/4) silty clay loam; moderate coarse subangular blocky structure; friable; thin continuous dark yellowish brown (10YR 4/4) clay films; patchy light gray (10YR 6/1 dry) silt coatings on faces of peds; some dark organic stains on faces of peds; few very fine roots; medium acid; gradual smooth boundary.
- C—51 to 60 inches; yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) silt loam; massive with distinct vertical cleavage planes; friable; common medium distinct yellowish brown (10YR 5/8) mottles; thin discontinuous brown (10YR 4/3) clay films; patchy light gray (10YR 6/1 dry) silt

coatings on cleavage planes; few fine and few very fine roots; slightly acid.

#### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 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—1 to 4

Texture—silt loam

*Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—silty clay loam

*BC and C horizons:*

Hue—10YR

Value—4 or 5

Chroma—4

Texture—silt loam

### 40D—Fayette silt loam, karst, 2 to 14 percent slopes

#### Composition

Fayette and similar soils: About 95 percent

Inclusions: About 5 percent

#### Setting

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 2 to 14 percent

#### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

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

*Organic matter content in 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

- Downs 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

### 163B—Fayette silt loam, 2 to 5 percent slopes

#### Composition

Fayette and similar soils: About 95 percent

Inclusions: About 5 percent

#### Setting

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 2 to 5 percent

#### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

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

*Organic matter content in 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

- Downs 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

### **163B2—Fayette silt loam, 2 to 5 percent slopes, moderately eroded**

#### **Composition**

Fayette and similar soils: About 90 percent

Inclusions: About 10 percent

#### **Setting**

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 2 to 5 percent

#### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 11.4 inches (high)

*Organic matter content in 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**

- Downs and similar soils
- Areas of severely eroded 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

### **163C—Fayette silt loam, 5 to 9 percent slopes**

#### **Composition**

Fayette and similar soils: About 85 percent

Inclusions: About 15 percent

#### **Setting**

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 5 to 9 percent

#### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

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

*Organic matter content in 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**

- Dubuque and similar soils
- Village and similar soils
- Areas of eroded 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

### **163C2—Fayette silt loam, 5 to 9 percent slopes, moderately eroded**

#### **Composition**

Fayette and similar soils: About 85 percent

Inclusions: About 15 percent

#### **Setting**

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 5 to 9 percent

#### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 11.4 inches (high)

*Organic matter content in 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***

- Dubuque and similar soils
- Village and similar soils
- Areas of severely eroded 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

### **163D—Fayette silt loam, 9 to 14 percent slopes**

#### ***Composition***

Fayette and similar soils: About 85 percent

Inclusions: About 15 percent

#### ***Setting***

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 9 to 14 percent

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

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

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

*Organic matter content in 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***

- Dubuque and similar soils
- Village and similar soils
- Areas of eroded 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

### **163D2—Fayette silt loam, 9 to 14 percent slopes, moderately eroded**

#### ***Composition***

Fayette and similar soils: About 85 percent

Inclusions: About 15 percent

#### ***Setting***

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 9 to 14 percent

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

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 11.4 inches (high)

*Organic matter content in 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***

- Dubuque and similar soils
- Village and similar soils
- Areas of severely eroded 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

**163E—Fayette silt loam, 14 to 18 percent slopes****Composition**

Fayette and similar soils: About 85 percent  
Inclusions: About 15 percent

**Setting**

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 14 to 18 percent

**Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

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

*Organic matter content in 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**

- Dubuque and similar soils
- Village and similar soils
- Areas of eroded 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

**163E2—Fayette silt loam, 14 to 18 percent slopes, moderately eroded****Composition**

Fayette and similar soils: About 85 percent  
Inclusions: About 15 percent

**Setting**

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 14 to 18 percent

**Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 11.4 inches (high)

*Organic matter content in 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**

- Dubuque and similar soils
- Village and similar soils
- Areas of severely eroded 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

**163F—Fayette silt loam, 18 to 25 percent slopes****Composition**

Fayette and similar soils: About 85 percent  
Inclusions: About 15 percent

**Setting**

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 18 to 25 percent

**Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

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

*Organic matter content in 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**

- Dubuque and similar soils
- Village and similar soils
- Areas of eroded 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

**163G—Fayette silt loam, 25 to 40 percent slopes****Composition**

Fayette and similar soils: About 85 percent

Inclusions: About 15 percent

**Setting**

*Landform:* Hills

*Position on landform:* Summits and back slopes

*Slope:* 25 to 40 percent

**Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess

*Flooding:* None

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

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

*Organic matter content in 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**

- Dubuque and similar soils
- Village and similar soils
- Areas of eroded 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

**Festina Series**

*Drainage class:* Well drained

*Permeability:* Moderate

*Landscape:* Stream terraces

*Landform:* Terraces

*Geomorphic component:* Treads

*Parent material:* Silty alluvium

*Native vegetation:* Deciduous trees and prairie grasses

*Slope range:* 2 to 9 percent

**Typical Pedon**

Festina silt loam, 2 to 5 percent slopes, in a cultivated field, 2,240 feet south and 2,320 feet east of the northwest corner of sec. 20, T. 100 N., R. 4 W.; U.S.G.S. New Albin, Iowa, Topographic Quadrangle; latitude 91 degrees, 20 minutes, and 28 seconds N. and longitude 43 degrees, 27 minutes, and 55 seconds W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common fine roots; neutral; abrupt smooth boundary.

E—8 to 11 inches; dark brown (10YR 4/3) silt loam; weak thin platy structure; friable; few fine roots; neutral; clear smooth boundary.

BE—11 to 16 inches; dark yellowish brown (10YR 4/4) silt loam; thin discontinuous dark brown (10YR 4/3)

clay films on faces of peds; few patchy light gray (10YR 7/1 dry) silt coatings; weak fine subangular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

**Bt1**—16 to 25 inches; dark yellowish brown (10YR 4/4) silty clay loam; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; common patchy light gray (10YR 7/1) silt coatings; weak medium prismatic structure parting to weak fine and medium subangular blocky; friable; very few dark concretions (iron and manganese oxides); few fine roots; medium acid; gradual smooth boundary.

**Bt2**—25 to 32 inches; dark yellowish brown (10YR 4/4) silt loam; common thin continuous dark brown (10YR 4/3) clay films on faces of peds; common patchy light gray (10YR 7/1) silt coatings; weak medium prismatic structure parting to weak medium subangular blocky; friable; few dark concretions (iron and manganese oxides); few fine roots; medium acid; clear smooth boundary.

**BC**—32 to 38 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct grayish brown (2.5Y 5/2) and few fine faint dark yellowish brown (10YR 4/6) mottles; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; few patchy light gray (10YR 7/1) silt coatings; weak medium prismatic structure; friable; few dark concretions (iron and manganese oxides); few very fine roots; medium acid; clear smooth boundary.

**C1**—38 to 56 inches; mottled grayish brown (2.5Y 5/2), brown (10YR 5/3), and dark yellowish brown (10YR 4/4) silt loam; few patchy light gray (10YR 7/1) silt coatings; massive; friable; common dark concretions (iron and manganese oxides); medium acid; clear smooth boundary.

**C2**—56 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common fine prominent strong brown (7.5YR 4/6), common fine distinct dark yellowish brown (10YR 4/6), and few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; slightly acid.

#### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Ap horizon:*

Hue—10YR

Value—3

Chroma—1 or 2

Texture—silt loam

*E horizon:*

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—silt loam

*Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—silty clay loam or silt loam

*C horizon:*

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—2 to 6

Texture—silt loam

### 978B—Festina silt loam, 2 to 5 percent slopes

#### Composition

Festina and similar soils: About 95 percent

Inclusions: About 5 percent

#### Setting

*Landform:* Terraces

*Slope:* 2 to 5 percent

#### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 12.8 inches (high)

*Organic matter content in 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

- Richwood 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

## 978C—Festina silt loam, 5 to 9 percent slopes

### Composition

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

### Setting

*Landform:* Terraces  
*Slope:* 5 to 9 percent

### Component Description

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 12.8 inches (high)  
*Organic matter content in 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 eroded 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

### Frankville Series

*Drainage class:* Well drained  
*Permeability:* Moderate in the upper part, slow in the lower part  
*Landscape:* Uplands  
*Landform:* Hills  
*Geomorphic component:* Side slopes and nose slopes  
*Hillslope position:* Shoulders and back slopes  
*Parent material:* Loess over limestone bedrock  
*Native vegetation:* Prairie grasses and open forest  
*Slope range:* 5 to 18 percent

### Typical Pedon

Frankville silt loam, 9 to 14 percent slopes, in a cultivated field, 1,000 feet east and 1,050 feet south of the northwest corner of sec. 11, T. 97 N., R. 6 W.; U.S.G.S. Frankville, Iowa, Topographic Quadrangle; latitude 91 degrees, 31 minutes, and 23 seconds N. and longitude 43 degrees, 14 minutes, and 16 seconds W.

- Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam; few brown (10YR 4/3) streaks and pockets; weak fine subangular blocky structure; friable; common very fine and few fine roots; medium acid; abrupt smooth boundary.
- Bt1—7 to 13 inches; dark yellowish brown (10YR 4/4) silty clay loam; few very dark gray (10Y 3/1) mixings; weak fine subangular blocky structure; friable; many thin discontinuous dark brown (10YR 3/3) clay films; few very fine roots; slightly acid; clear smooth boundary.
- Bt2—13 to 22 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; thin discontinuous dark brown (10YR 3/3) clay films; few very fine roots; strongly acid; clear smooth boundary.
- Bt3—22 to 26 inches; brown (10YR 4/3) silt loam; weak medium and fine subangular blocky structure; friable; thin continuous dark brown (10YR 3/3) clay films; few very fine roots; strongly acid; clear smooth boundary.
- 2Bt4—26 to 33 inches; dark brown (7.5YR 4/4) and brown (10YR 4/3) silty clay loam; weak medium subangular blocky structure; friable; thick discontinuous dark brown (10YR 3/3) clay films; few very fine roots; slightly acid; abrupt wavy boundary.
- 2R—33 to 60 inches; limestone bedrock.

### Range in Characteristics

*Depth to bedrock:* 20 to 40 inches

#### A horizon:

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

#### Bt horizon:

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

#### 2Bt horizon:

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



**903C2—Frankville silt loam, 5 to 9 percent slopes, moderately eroded****Composition**

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

**Setting**

*Landform:* Hills  
*Position on landform:* Head slopes, nose slopes, and side slopes  
*Slope:* 5 to 9 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* 20 to 40 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Loess over limestone  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 5.8 inches (low)  
*Organic matter content in 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 bedrock at a depth of more than 40 inches
- Areas of uneroded 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

**903D—Frankville silt loam, 9 to 14 percent slopes****Composition**

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

**Setting**

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 9 to 14 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* 20 to 40 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Loess over limestone  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 6.1 inches (moderate)  
*Organic matter content in 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**

- Soils that have bedrock at a depth of more than 40 inches
- Areas of eroded 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

**903D2—Frankville silt loam, 9 to 14 percent slopes, moderately eroded****Composition**

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

**Setting**

*Landform:* Hills  
*Position on landform:* Head slopes, nose slopes, and side slopes  
*Slope:* 9 to 14 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* 20 to 40 inches  
*Drainage class:* Well drained

*Dominant parent material:* Loess over limestone

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 5.8 inches (low)

*Organic matter content in 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 bedrock at a depth of more than 40 inches
- Areas of uneroded 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

### **903E2—Frankville silt loam, 14 to 18 percent slopes, moderately eroded**

#### ***Composition***

Frankville and similar soils: About 90 percent

Inclusions: About 10 percent

#### ***Setting***

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 14 to 18 percent

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

*Surface layer texture:* Silt loam

*Depth to bedrock:* 20 to 40 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over limestone

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 5.8 inches (low)

*Organic matter content in 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***

- Nordness and similar soils
- Areas of severely eroded 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

### ***Garwin Series***

*Drainage class:* Poorly drained

*Permeability:* Moderate

*Landscape:* Uplands

*Landform:* Interfluves

*Geomorphic component:* Swales

*Parent material:* Loess

*Native vegetation:* Prairie grasses and sedges

*Slope range:* 0 to 2 percent

#### ***Typical Pedon***

Garwin silty clay loam, 0 to 2 percent slopes, in a cultivated field, 1,620 feet east and 315 feet north of the southwest corner of sec. 8, T. 97 N., R. 6 W.; U.S.G.S. Frankville, Iowa, Topographic Quadrangle; latitude 91 degrees, 34 minutes, and 50 seconds N. and longitude 43 degrees, 13 minutes, and 38 seconds W.

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

A1—9 to 14 inches; black (10YR 2/1) silty clay loam, very dark gray (N 3/0) dry; moderate medium and fine subangular blocky structure; friable; common very fine roots; neutral; clear smooth boundary.

A2—14 to 20 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (N 4/0) dry; few fine distinct grayish brown (2.5Y 5/2) and few fine prominent strong brown (7.5YR 5/8) mottles; weak fine granular structure; friable; few very fine roots; neutral; clear smooth boundary.

BA—20 to 24 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent strong brown and few

fine distinct grayish brown (2.5Y 5/2) mottles; weak fine prismatic structure parting to weak fine subangular blocky; friable; few very fine roots; few black (10YR 2/1) iron or manganese accumulations; neutral; gradual smooth boundary.

Bg1—24 to 31 inches; olive gray (5Y 5/2) silt loam; many fine prominent strong brown (7.5YR 5/8) mottles; weak fine and medium prismatic structure parting to weak fine and medium subangular blocky; friable; few very fine roots; few black (10YR 2/1) iron or manganese accumulations; mildly alkaline; gradual smooth boundary.

Bg2—31 to 38 inches; olive gray (5Y 5/2) silt loam; many fine prominent strong brown (7.5YR 5/8) mottles; weak fine and medium prismatic structure parting to weak medium and fine subangular blocky; friable; few very fine roots; common black (10YR 2/1) iron or manganese accumulations; mildly alkaline; gradual smooth boundary.

Bg3—38 to 43 inches; olive gray (5Y 5/2) silt loam; common fine prominent strong brown (7.5YR 5/8) mottles; weak fine and medium prismatic structure parting to weak fine and medium subangular blocky; friable; few very fine roots; few black (10YR 2/1) iron or manganese oxides; mildly alkaline; clear smooth boundary.

Cg1—43 to 56 inches; olive gray (5Y 5/2) silt loam; common and few fine prominent strong brown (7.5YR 5/6 and 5/8) mottles; massive; friable; few black (10YR 2/1) iron or manganese accumulations; mildly alkaline; abrupt smooth boundary.

Cg2—56 to 60 inches; olive gray (5Y 5/2) silt loam; common medium prominent strong brown (7.5YR 5/8) mottles; massive; friable; few black (10YR 2/1) iron or manganese accumulations; mildly alkaline.

#### Range in Characteristics

*Depth to carbonates:* 48 to 72 inches

*Depth to bedrock:* Greater than 60 inches

*Thickness of the mollic epipedon:* 18 to 24 inches

*A horizon:*

Hue—10YR, 2.5Y, or neutral

Value—2 or 3

Chroma—0 or 1

Texture—silty clay loam

*Bg horizon:*

Hue—10YR, 2.5Y, or 5Y

Value—3 to 5

Chroma—1 or 2

Texture—silty clay loam or silt loam

*Cg horizon:*

Hue—7.5YR, 2.5Y, or 5Y

Value—4 to 6

Chroma—1 or 2

Texture—silt loam

## 118—Garwin silty clay loam, 0 to 2 percent slopes

### Composition

Garwin and similar soils: 100 percent

### Setting

*Landform:* Interfluves

*Position on landform:* Summits of hills

*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:* Loess

*Flooding:* None

*Seasonal high water table:* At the surface to 1 foot below the surface

*Available water capacity to 60 inches or root-limiting layer:* About 12.7 inches (high)

*Organic matter content in the surface layer:* About 6.5 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.

### Major Uses of the Unit

- Cropland
- Hayland
- Pasture

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

- Agronomy section

### Hawick Series

*Drainage class:* Excessively drained

*Permeability:* Very rapid

*Landscape:* Stream terraces

*Landform:* Terraces

*Geomorphic component:* Treads and risers

*Parent material:* Alluvium over sand and gravel

*Native vegetation:* Prairie grasses and deciduous trees

*Slope range:* 2 to 40 percent

### Typical Pedon

Hawick gravelly sand, 18 to 40 percent slopes, in a wooded pasture, 1,200 feet west and 250 feet south of the northeast corner of sec. 20, T. 99 N., R. 6 W.; U.S.G.S. Dorchester, Iowa, Topographic Quadrangle; latitude 91 degrees, 34 minutes, and 37 seconds N. and longitude 43 degrees, 23 minutes, and 9 seconds W.

A—0 to 10 inches; black (10YR 2/1) gravelly sand (about 20 percent gravel), dark gray (10YR 4/1) dry; weak fine granular structure; very friable; few medium, common fine, and many very fine roots; slight effervescence; moderately alkaline; clear wavy boundary.

C1—10 to 17 inches; brown (10YR 5/3) sand (about 10 percent gravel); single grained; loose; few medium and common very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

C2—17 to 30 inches; pale brown (10YR 6/3) sand (about 5 percent gravel); single grained; loose; few medium, few fine, and few very fine roots; strong effervescence; moderately alkaline; abrupt smooth boundary.

C3—30 to 33 inches; pale brown (10YR 6/3) sand (about 10 percent gravel); single grained; loose; few fine and few very fine roots; strong effervescence; moderately alkaline; abrupt smooth boundary.

C4—33 to 46 inches; pale brown (10YR 6/3) sand (about 5 percent gravel); single grained; loose; few very fine roots; strong effervescence; moderately alkaline; clear smooth boundary.

C5—46 to 60 inches; pale brown (10YR 6/3) sand (about 10 percent gravel); single grained; loose; strong effervescence; moderately alkaline.

### Range in Characteristics

*Depth to carbonates:* 0 to 20 inches

*Depth to bedrock:* Greater than 60 inches

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—gravelly sand

*C horizon:*

Hue—10YR

Value—4 to 6

Chroma—3 to 6

Texture—sand or gravelly sand

### 740C—Hawick gravelly sand, 2 to 9 percent slopes

#### Composition

Hawick and similar soils: About 95 percent

Inclusions: About 5 percent

#### Setting

*Landform:* Terraces

*Slope:* 2 to 9 percent

#### Component Description

*Surface layer texture:* Gravelly sand

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Excessively drained

*Dominant parent material:* Loamy alluvium over calcareous sand and gravel

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 2.8 inches (very low)

*Organic matter content in the surface layer:* About 1 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

- Soils that have a surface layer of sandy loam

#### Major Uses of the Unit

- Cropland
- Hayland
- Pasture

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

- Agronomy section

### 740G—Hawick gravelly sand, 18 to 40 percent slopes

#### Composition

Hawick and similar soils: About 95 percent

Inclusions: About 5 percent

#### Setting

*Landform:* Terraces

*Slope:* 18 to 40 percent

#### Component Description

*Surface layer texture:* Gravelly sand

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Excessively drained

*Dominant parent material:* Loamy alluvium over calcareous sand and gravel

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 2.8 inches (very low)

*Organic matter content in the surface layer:* About 1 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**

- Soils that have a surface layer of sandy loam

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

- Pasture

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

- Agronomy section

### **Huntsville Series**

*Drainage class:* Well drained

*Permeability:* Moderate

*Landscape:* Flood plains

*Landform:* Flood plains

*Parent material:* Alluvium

*Native vegetation:* Prairie grasses

*Slope range:* 0 to 5 percent

#### **Typical Pedon**

Huntsville silt loam, 0 to 2 percent slopes, in a cultivated field, 790 feet north and 2,390 feet west of the southeast corner of sec. 1, T. 98 N., R. 5 W.; U.S.G.S. Waukon, Iowa, Topographic Quadrangle; latitude 91 degrees, 22 minutes, and 43 seconds N. and longitude 43 degrees, 19 minutes, and 45 seconds W.

Ap—0 to 8 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; gradual smooth boundary.

A1—8 to 12 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; gradual smooth boundary.

A2—12 to 23 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; few very fine roots; neutral; gradual smooth boundary.

A3—23 to 30 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; gradual smooth boundary.

A4—30 to 39 inches; very dark brown (10YR 2/2) silt

loam, dark grayish brown (10YR 4/2) dry; weak medium prismatic structure parting to weak fine subangular blocky; friable; few very fine roots; neutral; gradual smooth boundary.

BA—39 to 48 inches; dark brown (10YR 4/3) and very dark grayish brown (10YR 3/2) silt loam; weak medium prismatic structure parting to weak medium and fine subangular blocky; friable; few very fine roots; neutral; gradual smooth boundary.

Bw—48 to 60 inches; dark brown (10YR 4/3) silt loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; neutral.

#### **Range in Characteristics**

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Thickness of the mollic epipedon:* 24 to 40 inches

*Ap and A horizons:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

*Bw horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—silt loam

*C horizon (if it occurs):*

Hue—10YR

Value—3 to 5

Chroma—3 or 4

Texture—silt loam

### **98—Huntsville silt loam, 0 to 2 percent slopes**

#### **Composition**

Huntsville 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:* Well drained

*Flooding:* Occasional

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

*Available water capacity to 60 inches or root-limiting layer:* About 13.4 inches (high)

*Organic matter content in 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***

- 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

### **98B—Huntsville silt loam, 2 to 5 percent slopes**

#### ***Composition***

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

#### ***Setting***

*Landform:* Flood plains  
*Slope:* 2 to 5 percent

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

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Flooding:* Occasional  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 13.4 inches (high)  
*Organic matter content in 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***

- Areas of recent stratified alluvium

#### ***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

### ***Ion Series***

*Drainage class:* Moderately well drained

*Permeability:* Moderate

*Landscape:* Flood plains

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

#### ***Typical Pedon***

Ion silt loam, 0 to 2 percent slopes, in a cultivated field, 1,800 feet east and 1,850 feet south of the northwest corner of sec. 30, T. 100 N., R. 6 W.; U.S.G.S. Dorchester, Iowa, Topographic Quadrangle; latitude 91 degrees, 36 minutes, and 15 seconds N. and longitude 43 degrees, 27 minutes, and 8 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine and very fine subangular blocky structure; friable; few very fine roots; moderately alkaline; slight effervescence; clear smooth boundary.

C1—9 to 33 inches; stratified very dark grayish brown (10YR 3/2), very dark gray (10YR 3/1), grayish brown (10YR 5/2), and brown (10YR 5/3) silt loam; massive with thin to thick platelike structure resulting from stratification; friable; few very fine roots; moderately alkaline; slight effervescence; clear smooth boundary.

C2—33 to 36 inches; stratified black (10YR 2/1), very dark grayish brown (10YR 3/2), grayish brown (10YR 5/2), and brown (10YR 5/3) silt loam; massive with thin to thick platelike structure resulting from stratification; friable; moderately alkaline; slight effervescence; clear smooth boundary.

2Ab—36 to 60 inches; black (10YR 2/1) silt loam; moderate fine and very fine subangular blocky structure; friable; few small snail-shell fragments; moderately alkaline; slight effervescence.

#### ***Range in Characteristics***

*Depth to carbonates:* 0 to 10 inches

*Depth to bedrock:* Greater than 60 inches

*Depth to Ab horizon:* 20 to 40 inches

*A or Ap horizon:*

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

*C horizon:*

Hue—10YR  
 Value—2 to 5  
 Chroma—1 to 3  
 Texture—silt loam

*2Ab horizon:*

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

**2670—lon silt loam, 0 to 2 percent slopes****Composition**

lon 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:* Moderately well drained  
*Dominant parent material:* Calcareous local alluvium  
*Flooding:* Occasional  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 12.7 inches (high)  
*Organic matter content in 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**

- Somewhat poorly drained soils

**Major Uses of the Unit**

- Cropland (fig. I-6)
- Hayland
- Pasture

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

- Agronomy section

**Lacrescent Series**

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, moderately rapid in the lower part

*Landscape:* Uplands

*Landform:* Hills

*Geomorphic component:* Side slopes and nose slopes

*Hillslope position:* Back slopes

*Parent material:* Pedisediment

*Native vegetation:* Deciduous trees

*Slope range:* 14 to 70 percent

**Typical Pedon**

Lacrescent silt loam, 25 to 70 percent slopes, in a wooded area, 500 feet west and 940 feet south of the northeast corner of sec. 11, T. 99 N., R. 6 W.; U.S.G.S. Dorchester, Iowa, Topographic Quadrangle; latitude 91 degrees, 30 minutes, and 47 seconds N. and longitude 43 degrees, 24 minutes, and 41 seconds W.

- A1—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate medium and fine subangular blocky structure; friable; few coarse, common medium, many fine, and many very fine roots; about 5 percent coarse fragments (2 to 5 centimeters); neutral; clear smooth boundary.
- A2—9 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, dark gray (10YR 4/1) dry; very dark gray (10YR 3/1) coatings on faces of peds; moderate medium and fine subangular blocky structure; friable; few coarse, few medium, common fine, and common very fine roots; about 5 percent coarse fragments (2 to 5 centimeters); neutral; clear smooth boundary.
- Bw1—12 to 14 inches; brown and dark brown (10YR 4/3) gravelly loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium and fine subangular blocky structure; friable; few coarse, few medium, and few fine roots; about 15 percent coarse fragments (2 to 10 centimeters); neutral; clear smooth boundary.
- Bw2—14 to 20 inches; dark yellowish brown (10YR 4/4) loam; discontinuous very dark grayish brown (10YR 3/2) coatings on faces of peds; moderate fine and very fine subangular blocky structure; friable; common coarse, few medium, and few fine roots; about 5 percent coarse fragments (2 to 7 centimeters); about 5 percent coarse fragments (8 to 20 centimeters); slightly acid; abrupt wavy boundary.
- Bw3—20 to 27 inches; dark yellowish brown (10YR 4/4) cobbly loam; brown and dark brown (10YR 4/3) coatings on faces of peds; moderate fine and very fine subangular blocky structure; friable; few



Figure 1-6.—A tilled area of Ion silt loam, 0 to 2 percent slopes. This soil is well suited to row crops if the occasional flooding is controlled. Lacrescent silt loam, 25 to 70 percent slopes, is in the steep wooded areas in the background.

medium and few fine roots; about 10 percent coarse fragments (2 to 7 centimeters); about 20 percent coarse fragments (8 to 25 centimeters); about 5 percent coarse fragments (25 to 50 centimeters); slightly acid; abrupt wavy boundary.

BC—27 to 44 inches; dark yellowish brown (10YR 4/4) very cobbly loam; weak fine subangular blocky structure; friable; few fine and few very fine roots; about 15 percent coarse fragments (2 to 7 centimeters); about 35 percent coarse fragments (8 to 25 centimeters); about 5 percent coarse fragments (25 to 60 centimeters); about 5 percent coarse fragments (60 to 75 centimeters); slight effervescence; moderately alkaline; gradual wavy boundary.

C—44 to 60 inches; yellowish brown (10YR 5/4) very cobbly loam; massive; friable; few medium, few fine, and few very fine roots; about 15 percent coarse fragments (2 to 7 centimeters); about 40 percent coarse fragments (8 to 25 centimeters); about 10 percent coarse fragments (25 to 60 centimeters); about 10 percent coarse fragments (60 to 100 centimeters); strong effervescence; moderately alkaline.

#### Range in Characteristics

*Depth to carbonates:* 20 to 36 inches

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

*Thickness of the mollic epipedon:* 10 to 20 inches



*A horizon:*

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

*Bw horizon:*

Hue—10YR  
 Value—4  
 Chroma—3 or 4  
 Texture—silt loam, loam, or sandy loam

*C horizon:*

Hue—10YR or 2.5Y  
 Value—4 or 5  
 Chroma—3 or 4  
 Texture—loam, silt loam, or sandy loam

**840E—Lacrescent silt loam, 14 to 18 percent slopes****Composition**

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

**Setting**

*Landform:* Hills  
*Position on landform:* Head slopes, nose slopes, and side slopes  
*Slope:* 14 to 18 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Pedisediment  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 6.0 inches (moderate)  
*Organic matter content in 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**

- Bedrock outcrops

**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

**840F—Lacrescent silt loam, 18 to 25 percent slopes****Composition**

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

**Setting**

*Landform:* Hills  
*Position on landform:* Head slopes, nose slopes, and side slopes  
*Slope:* 18 to 25 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Pedisediment  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 6.0 inches (moderate)  
*Organic matter content in 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**

- Bedrock outcrops

**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

**840G—Lacrescent silt loam, 25 to 70 percent slopes****Composition**

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

### Setting

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 25 to 70 percent

### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Pedisediment

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 6.0 inches (moderate)

*Organic matter content in 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

- Bedrock outcrops

### 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

### Lawson Series

*Drainage class:* Somewhat poorly drained

*Permeability:* Moderate

*Landscape:* Flood plains

*Landform:* Flood plains

*Parent material:* Alluvium

*Native vegetation:* Prairie grasses with scattered trees

*Slope range:* 0 to 2 percent

### Typical Pedon

Lawson silt loam, 0 to 2 percent slopes, in a cultivated field, 2,000 feet east and 2,050 feet south of the northwest corner of sec. 25, T. 99 N., R. 4 W.; U.S.G.S. Church, Iowa, Topographic Quadrangle; latitude 91 degrees, 15 minutes, and 54 seconds N. and longitude 43 degrees, 21 minutes, and 52 seconds W.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak fine granular structure;

friable; neutral; clear smooth boundary.

A1—9 to 20 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak fine granular structure parting to weak fine subangular blocky; friable; neutral; clear smooth boundary.

A2—20 to 32 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; few fine faint brown (10YR 4/3) mottles; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

C1—32 to 44 inches; mottled dark grayish brown (2.5Y 4/2) and dark yellowish brown (10YR 4/6) silt loam; thin discontinuous very dark brown (10YR 2/2) coatings on faces of peds; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

C2—44 to 60 inches; mottled dark grayish brown (2.5Y 4/2), dark brown (10YR 4/3), and grayish brown (10YR 5/2) silt loam; very dark gray (10YR 3/1) clay flows in root channels; massive; friable; neutral.

### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 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—silt loam

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

#### Composition

Lawson 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:* Somewhat poorly drained

*Dominant parent material:* Local alluvium

*Flooding:* Occasional

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

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

*Organic matter content in the surface layer:* About 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**

- Otter 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

## **Lycurgus Series**

*Drainage class:* Well drained

*Permeability:* Moderate

*Landscape:* Uplands

*Landform:* Hills

*Geomorphic component:* Base slopes

*Hillslope position:* Foot slopes

*Parent material:* Loamy sediments over loess

*Native vegetation:* Prairie grasses with scattered trees

*Slope range:* 9 to 25 percent

### **Typical Pedon**

Lycurgus silt loam, 14 to 18 percent slopes, in a cultivated field, 1,950 feet east and 2,050 feet north of the southwest corner of sec. 4, T. 98 N., R. 5 W.; U.S.G.S. Waukon, Iowa, Topographic Quadrangle; latitude 91 degrees, 26 minutes, and 27 seconds N. and longitude 43 degrees, 19 minutes, and 58 seconds W.

A1—0 to 3 inches; very dark brown (10YR 2/2) silt loam (19 percent sand), dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; many medium discontinuous tubular and many fine discontinuous tubular roots; few fine tubular pores; neutral; clear smooth boundary.

A2—3 to 7 inches; very dark brown (10YR 2/2) silt loam (20 percent sand), dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; many medium discontinuous tubular roots; few fine tubular pores; neutral; clear smooth boundary.

A3—7 to 13 inches; 85 percent dark brown (10YR 3/3), 10 percent very dark grayish brown (10YR 3/2), and 5 percent very dark brown (10YR 2/2) silt loam (19 percent sand), brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; common very fine discontinuous tubular roots; few fine tubular pores; neutral; clear smooth boundary.

BA—13 to 20 inches; 85 percent brown and dark brown (10YR 4/3), 10 percent dark brown (10YR 3/3), and 5 percent very dark grayish brown (10YR 3/2) silt loam (18 percent sand); weak fine and medium subangular blocky structure; friable; few very fine discontinuous tubular and few fine discontinuous tubular roots; few fine tubular pores; less than 1 percent gravel-sized particles; neutral; gradual smooth boundary.

Bt1—20 to 30 inches; dark yellowish brown (10YR 4/4) silt loam (16 percent sand); weak medium subangular blocky structure; friable; few fine discontinuous tubular roots; few fine tubular pores; discontinuous faint very dark grayish brown (10YR 3/2) clay films on vertical and horizontal faces of peds; less than 1 percent chert fragments; less than 1 percent sandstone fragments; neutral; gradual smooth boundary.

2Bt2—30 to 38 inches; yellowish brown (10YR 5/6) silty clay loam (6 percent sand); few fine faint grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine discontinuous tubular roots; few fine tubular pores; discontinuous faint dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; gradual smooth boundary.

2Bt3—38 to 47 inches; yellowish brown (10YR 5/4) silty clay loam (6 percent sand); few fine faint grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; friable; few fine discontinuous tubular roots; few fine tubular pores; discontinuous faint dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; gradual smooth boundary.

2Bt4—47 to 60 inches; yellowish brown (10YR 5/4) silt loam (7 percent sand); few fine faint grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; few fine discontinuous tubular roots; few fine tubular pores; discontinuous distinct dark yellowish brown (10YR 4/4) clay films on vertical and horizontal faces of peds; slightly acid.

### **Range in Characteristics**

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Thickness of loamy sediments:* 20 to 48 inches

*Percent sand in loamy sediments:* 10 to 40 percent

*A or Ap horizon:*

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

*Bt horizon:*

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

*C horizon (if it occurs):*

Hue—10YR  
Value—4 to 6  
Chroma—4 to 6  
Texture—silt loam

**1120D—Lycurgus silt loam, 9 to 14 percent slopes**

***Composition***

Lycurgus and similar soils: About 85 percent  
Inclusions: About 15 percent

***Setting***

*Landform:* Hills

*Position on landform:* Back slopes and foot slopes

*Slope:* 9 to 14 percent

***Component Description***

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loamy sediments over silty deposits

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 12.6 inches (high)

*Organic matter content in 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***

- Soils that have a thinner surface layer
- Soils that have a surface layer of sandy loam
- Soils that have a thicker surface 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

**1120E—Lycurgus silt loam, 14 to 18 percent slopes**

***Composition***

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

***Setting***

*Landform:* Hills

*Position on landform:* Back slopes and foot slopes

*Slope:* 14 to 18 percent

***Component Description***

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loamy sediments over silty deposits

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 12.6 inches (high)

*Organic matter content in 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***

- Soils that have a thinner surface soil
- Soils that have a surface layer of sandy loam

***Major Uses of the Unit***

- Cropland
- Hayland
- Pasture

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

- Agronomy section

**1120F—Lycurgus silt loam, 18 to 25 percent slopes****Composition**

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

**Setting**

*Landform:* Hills  
*Position on landform:* Back slopes and foot slopes  
*Slope:* 18 to 25 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Loamy sediments over silty deposits  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 12.6 inches (high)  
*Organic matter content in 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**

- Soils that have a thinner surface soil
- Soils that have a surface layer of sandy loam

**Major Uses of the Unit**

- Pasture

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

- Agronomy section

**Massbach Series**

*Drainage class:* Moderately well drained  
*Permeability:* Moderate in the upper part, very slow or slow in the lower part  
*Landscape:* Uplands  
*Landform:* Hills  
*Geomorphic component:* Side slopes  
*Hillslope position:* Back slopes  
*Parent material:* Loess over weathered shale  
*Native vegetation:* Prairie grasses and open forest  
*Slope range:* 3 to 15 percent

**Typical Pedon**

Massbach silt loam, 3 to 9 percent slopes, in a cultivated field, 2,600 feet north and 600 feet east of the southwest corner of sec. 7, T. 97 N., R. 4 W.; U.S.G.S. Waterville, Iowa, Topographic Quadrangle; latitude 91 degrees, 22 minutes, and 3 seconds N. and longitude 43 degrees, 13 minutes, and 58 seconds W.

- Ap—0 to 9 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine and fine subangular blocky structure; friable; common very fine and few fine roots; slightly acid; abrupt smooth boundary.
- BE—9 to 13 inches; dark grayish brown (10YR 4/2) silt loam; weak medium platy structure parting to weak fine and very fine subangular blocky; friable; few very fine roots; medium acid; clear smooth boundary.
- Bt1—13 to 22 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; few very fine roots; strongly acid; gradual smooth boundary.
- Bt2—22 to 29 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak fine prismatic structure parting to weak medium and fine subangular blocky; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; few very fine roots; strongly acid; clear smooth boundary.
- Bt3—29 to 35 inches; olive (5Y 5/3) silty clay loam; few fine prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; friable; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; few very fine roots; very dark brown (10YR 2/2) accumulations; medium acid; abrupt wavy boundary.
- 2BC—35 to 41 inches; greenish gray (5GY 6/1) shale; few fine distinct olive yellow mottles; massive; very firm; many pale olive (5Y 6/3) carbonate layers; neutral.
- 2Cr—41 inches; shale bedrock.

**Range in Characteristics**

*Depth to carbonates:* 20 to 40 inches  
*Depth to unconsolidated bedrock:* 20 to 40 inches

**A horizon:**

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

**BE horizon:**

Hue—10YR  
Value—4

Chroma—2 or 3  
Texture—silt loam

**Bt horizon:**

Hue—10YR, 2.5Y, or 5Y  
Value—4 or 5  
Chroma—2 to 6  
Texture—silt loam or silty clay loam

**2BC horizon:**

Hue—5Y, 5GY, or 5G  
Value—5 or 6  
Chroma—1 to 6  
Texture—silty clay or clay

**721C—Massbach silt loam, 3 to 9 percent slopes****Composition**

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

**Setting**

*Landform:* Hills  
*Position on landform:* Back slopes  
*Slope:* 3 to 9 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* 40 to 60 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Loess over weathered shale  
*Flooding:* None  
*Seasonal high water table:* Perched at a depth of 3 to 5 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 7.0 inches (moderate)  
*Organic matter content in 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 shale bedrock
- Areas of eroded 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

**721D—Massbach silt loam, 9 to 15 percent slopes****Composition**

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

**Setting**

*Landform:* Hills  
*Position on landform:* Back slopes  
*Slope:* 9 to 15 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* 40 to 60 inches  
*Drainage class:* Moderately well drained  
*Dominant parent material:* Loess over weathered shale  
*Flooding:* None  
*Seasonal high water table:* Perched at a depth of 3 to 5 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 7.0 inches (moderate)  
*Organic matter content in 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 shale bedrock
- Areas of eroded 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

**Medary Series**

*Drainage class:* Well drained  
*Permeability:* Slow

*Landscape:* Stream terraces

*Landform:* Terraces

*Geomorphic component:* Risers

*Parent material:* Lacustrine deposits

*Native vegetation:* Deciduous trees

*Slope range:* 14 to 45 percent

### Typical Pedon

Medary silt loam, 14 to 45 percent slopes, in a wooded pasture, 450 feet east and 220 feet north of the southwest corner of sec. 33, T. 99 N., R. 3 W.; U.S.G.S. Lansing, Iowa, Topographic Quadrangle; latitude 91 degrees, 12 minutes, and 37 seconds N. and longitude 43 degrees, 20 minutes, and 39 seconds W.

- A—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine and very fine subangular blocky structure; friable; few medium and few fine roots; slightly acid; clear smooth boundary.
- BE—4 to 8 inches; brown and dark brown (7.5YR 4/4) and very dark grayish brown (10YR 3/2) silty clay loam; few fine distinct strong brown (7.5YR 4/6) mottles; weak fine subangular blocky structure; friable; few medium and few fine roots; slightly acid; clear smooth boundary.
- Bt1—8 to 18 inches; brown and dark brown (7.5YR 4/4) silty clay; moderate fine and very fine subangular blocky structure; firm; thin continuous dark brown (7.5YR 3/4) clay films on faces of peds; few fine roots; medium acid; gradual smooth boundary.
- Bt2—18 to 23 inches; brown and dark brown (10YR 4/3) silty clay; few medium distinct strong brown (7.5YR 4/6) mottles; moderate fine subangular blocky structure; firm; thin continuous dark brown (10YR 3/3) clay films on faces of peds; few fine roots; medium acid; abrupt smooth boundary.
- Bt3—23 to 26 inches; brown and dark brown (10YR 4/3) silty clay; few fine distinct strong brown (7.5YR 4/6) mottles; moderate fine subangular blocky structure; firm; thin continuous very dark grayish brown (10YR 3/2) clay films on faces of peds; common carbonate concretions and common disseminated carbonates on faces of peds; few fine roots; neutral; abrupt smooth boundary.
- C1—26 to 37 inches; stratified reddish brown (5YR 4/3) and brown and dark brown (7.5YR 4/4) clay to sandy loam; massive with vertical cleavage planes; firm and friable; thin discontinuous dark brown (7.5YR 3/2) clay films on faces of cleavage planes; common disseminated carbonates; few fine roots; strong effervescence; mildly alkaline; abrupt smooth boundary.
- C2—37 to 44 inches; mottled light brownish gray (10YR 6/2), brownish yellow (10YR 6/6), and strong brown

(7.5YR 4/6) silt loam; massive; friable; pockets of disseminated carbonates; slight effervescence; mildly alkaline; abrupt smooth boundary.

C3—44 to 52 inches; stratified light brownish gray (10YR 6/2) and brown and dark brown (7.5YR 4/4) silt loam, clay, and sandy loam; massive; firm and friable; pockets of disseminated carbonates; slight effervescence; mildly alkaline; abrupt smooth boundary.

C4—52 to 60 inches; stratified brown (10YR 5/3), dark brown, and brown (7.5YR 4/4) and light brownish gray (10YR 6/2) silt loam; few fine distinct dark brown (7.5YR 3/2) and strong brown (7.5YR 4/6) mottles; massive; friable; violent effervescence; moderately alkaline.

### Range in Characteristics

*Depth to carbonates:* 24 to 60 inches

*Depth to bedrock:* Greater than 60 inches

*A or Ap horizon:*

Hue—10YR or 7.5YR

Value—3 to 5

Chroma—1 to 4

Texture—silt loam

*BE horizon:*

Hue—10YR or 7.5YR

Value—3 to 5

Chroma—2 to 6

Texture—silt loam or silty clay loam

*Bt horizon:*

Hue—10YR, 7.5YR, or 5YR

Value—4 or 5

Chroma—3 to 6

Texture—silty clay loam, silty clay, or clay

*C horizon:*

Hue—10YR, 7.5YR, or 5YR

Value—4 to 6

Chroma—2 to 8

Texture—strata of silty clay, clay, silt loam, or sandy loam

## 951G—Medary silt loam, 14 to 45 percent slopes

### Composition

Medary and similar soils: 100 percent

### Setting

*Landform:* Terraces

*Slope:* 14 to 45 percent

### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Lacustrine deposits  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 9.1 inches (high)  
*Organic matter content in 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**

- Pasture
- Forest land

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

- Agronomy section
- Forest Land section

### **Muscatine Series**

*Drainage class:* Somewhat poorly drained  
*Permeability:* Moderate  
*Landscape:* Uplands  
*Landform:* Interfluves  
*Geomorphic component:* Interfluves  
*Hillslope position:* Summits  
*Parent material:* Loess  
*Native vegetation:* Tall prairie grasses  
*Slope range:* 1 to 4 percent

#### **Typical Pedon**

Muscatine silt loam, 1 to 4 percent slopes, in a cultivated field, 50 feet east and 1,000 feet south of the center of sec. 8, T. 97 N., R. 6 W.; U.S.G.S. Frankville, Iowa, Topographic Quadrangle; latitude 91 degrees, 34 minutes, and 34 seconds N. and longitude 43 degrees, 13 minutes, and 51 seconds W.

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

A—10 to 14 inches; black (10YR 2/1) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; clear smooth boundary.

AB—14 to 17 inches; very dark gray (10YR 3/1) and

very dark grayish brown (10YR 3/2) silty clay loam, gray (10YR 5/1) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Bg1—17 to 22 inches; dark grayish brown (10YR 4/2) silty clay loam; continuous very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) coatings on faces of peds; weak fine prismatic structure parting to weak fine and medium subangular blocky; friable; few very fine roots; neutral; clear smooth boundary.

Bg2—22 to 26 inches; dark grayish brown (2.5Y 4/2) silty clay loam; continuous dark grayish brown (10YR 4/2) coatings on faces of peds; few fine distinct brown (7.5YR 5/4) mottles; weak medium prismatic structure parting to weak medium and fine subangular blocky; friable; few very fine roots; neutral; gradual smooth boundary.

Bg3—26 to 34 inches; dark grayish brown (2.5Y 4/3) silty clay loam; many fine and few coarse very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine distinct brown (7.5YR 5/4) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; neutral; gradual smooth boundary.

BCg—34 to 43 inches; mottled dark grayish brown (2.5Y 4/3), dark brown (7.5YR 4/4), and dark yellowish brown (10YR 4/4) silt loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine root pores with dark grayish brown (10YR 4/2) cutans on sides; neutral; gradual smooth boundary.

Cg—43 to 60 inches; mottled light brownish gray (2.5Y 6/2), grayish brown (2.5Y 5/2), and yellowish brown (10YR 5/6 and 5/4) silt loam; massive; friable; few fine root pores with dark grayish brown (10YR 4/2) cutans on sides; neutral.

#### **Range in Characteristics**

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Thickness of the mollic epipedon:* 12 to 22 inches

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

*Bg and Bw horizons:*

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—2 to 4

Texture—silty clay loam

*BC and C horizons:*

Hue—2.5Y or 5Y



Value—4 to 6  
 Chroma—2 to 6  
 Texture—silt loam or silty clay loam

## 119B—Muscatine silt loam, 1 to 4 percent slopes

### Composition

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

### Setting

*Landform:* Interfluves  
*Position on landform:* Summits of hills  
*Slope:* 1 to 4 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  
*Available water capacity to 60 inches or root-limiting layer:* About 11.8 inches (high)  
*Organic matter content in the surface layer:* About 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

- Garwin 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

### Nordness Series

*Drainage class:* Well drained  
*Permeability:* Moderate  
*Landscape:* Uplands  
*Landform:* Hills  
*Geomorphic component:* Side slopes and nose slopes

*Hillslope position:* Shoulders and back slopes  
*Parent material:* Loamy pedis sediment over limestone bedrock

*Native vegetation:* Deciduous trees

*Slope range:* 5 to 60 percent

### Typical Pedon

Nordness silt loam, 14 to 18 percent slopes, in a wooded area, 1,200 feet north and 800 feet east of the center of sec. 16, T. 98 N., R. 5 W.; U.S.G.S. Waukon, Iowa, Topographic Quadrangle; latitude 91 degrees, 26 minutes, and 17 seconds N. and longitude 43 degrees, 18 minutes, and 32 seconds W.

A—0 to 3 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; few dark grayish brown (10YR 4/2) mixings; weak very fine and fine subangular blocky structure; friable; many very fine and few fine and medium roots; mildly alkaline; abrupt smooth boundary.

E—3 to 5 inches; dark grayish brown (10YR 4/2) silt loam; some very dark gray (10YR 3/1) mixings; weak thin platy structure parting to weak very fine subangular blocky; friable; few very fine, fine, and medium roots; neutral; clear smooth boundary.

BE—5 to 12 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and very fine subangular blocky structure; friable; few very fine, fine, and medium roots; neutral; clear smooth boundary.

Bt1—12 to 14 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate very fine subangular blocky structure; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; few medium and fine roots; slightly acid; clear smooth boundary.

2Bt2—14 to 15 inches; brown (10YR 4/3) silty clay; moderate very fine and fine subangular and angular blocky structure; firm; thin continuous brown (10YR 3/3) clay films on faces of peds; mildly alkaline; abrupt wavy boundary.

2R—15 to 60 inches; fractured limestone bedrock.

### Range in Characteristics

*Depth to carbonates:* 8 to 20 inches

*Depth to bedrock:* 8 to 20 inches

*A horizon:*

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

*Ap horizon (if it occurs):*

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

*E horizon:*

Hue—10YR  
 Value—4  
 Chroma—2  
 Texture—silt loam

*Bt horizon:*

Hue—10YR in the upper part, 10YR or 7.5YR in the lower part  
 Value—4 or 5  
 Chroma—3 to 6  
 Texture—silty clay loam in the upper part, silty clay or clay in the lower part

### **478G—Nordness-Rock outcrop complex, 25 to 60 percent slopes**

#### ***Composition***

Nordness and similar soils: About 50 percent  
 Rock outcrop: 40 percent  
 Inclusions: About 10 percent

#### ***Setting***

*Landform:* Hills  
*Position on landform:* Back slopes and shoulders  
*Slope:* 25 to 60 percent

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

##### **Nordness**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* 8 to 20 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Loamy pedisegment over limestone  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 3.1 inches (low)  
*Organic matter content in the surface layer:* About 2.5 percent (moderate)

##### **Rock outcrop**

*Kind of material:* Unweathered limestone bedrock  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet

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***

- Intermixed limestone flags

### ***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

### **499C—Nordness silt loam, 5 to 9 percent slopes**

#### ***Composition***

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

#### ***Setting***

*Landform:* Hills  
*Position on landform:* Back slopes and shoulders  
*Slope:* 5 to 9 percent

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

*Surface layer texture:* Silt loam  
*Depth to bedrock:* 8 to 20 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Loamy pedisements over limestone  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 3.1 inches (low)  
*Organic matter content in 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 bedrock at a depth of more than 20 inches

### ***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

**499D—Nordness silt loam, 9 to 14 percent slopes****Composition**

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

**Setting**

*Landform:* Hills  
*Position on landform:* Back slopes and shoulders  
*Slope:* 9 to 14 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* 8 to 20 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Loamy pedisediments over limestone  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 3.1 inches (low)  
*Organic matter content in 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 bedrock at a depth of more than 20 inches

**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

**499D2—Nordness silt loam, 9 to 14 percent slopes, moderately eroded****Composition**

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

**Setting**

*Landform:* Hills  
*Position on landform:* Back slopes and shoulders

*Slope:* 9 to 14 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* 8 to 20 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Loamy pedisediments over limestone  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 3.1 inches (low)  
*Organic matter content in 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 bedrock at a depth of more than 20 inches

**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

**499E—Nordness silt loam, 14 to 18 percent slopes****Composition**

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

**Setting**

*Landform:* Hills  
*Position on landform:* Back slopes and shoulders  
*Slope:* 14 to 18 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* 8 to 20 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Loamy pedisediments over limestone  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet

*Available water capacity to 60 inches or root-limiting layer:* About 3.1 inches (low)

*Organic matter content in 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 bedrock at a depth of more than 20 inches

#### ***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

### **499E2—Nordness silt loam, 14 to 18 percent slopes, moderately eroded**

#### ***Composition***

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

#### ***Setting***

*Landform:* Hills

*Position on landform:* Back slopes and shoulders

*Slope:* 14 to 18 percent

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

*Surface layer texture:* Silt loam

*Depth to bedrock:* 8 to 20 inches

*Drainage class:* Well drained

*Dominant parent material:* Loamy pedisements over limestone

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 3.1 inches (low)

*Organic matter content in 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 bedrock at a depth of more than 20 inches

#### ***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

### **499F—Nordness silt loam, 18 to 25 percent slopes**

#### ***Composition***

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

#### ***Setting***

*Landform:* Hills

*Position on landform:* Back slopes and shoulders

*Slope:* 18 to 25 percent

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

*Surface layer texture:* Silt loam

*Depth to bedrock:* 8 to 20 inches

*Drainage class:* Well drained

*Dominant parent material:* Loamy pedisements over limestone

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 3.1 inches (low)

*Organic matter content in 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 bedrock at the surface
- Soils that have bedrock at a depth of more than 20 inches

#### ***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

## 499G—Nordness silt loam, 25 to 40 percent slopes

### Composition

Nordness and similar soils: About 95 percent

Inclusions: About 5 percent

### Setting

*Landform:* Hills

*Position on landform:* Back slopes and shoulders

*Slope:* 25 to 40 percent

### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* 8 to 20 inches

*Drainage class:* Well drained

*Dominant parent material:* Loamy pedisements over limestone

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 3.1 inches (low)

*Organic matter content in 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 bedrock at the surface

### 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

### Orion Series

*Drainage class:* Somewhat poorly drained

*Permeability:* Moderate

*Landscape:* Flood plains

*Landform:* Flood plains

*Parent material:* Alluvium

*Native vegetation:* Prairie grasses

*Slope range:* 0 to 2 percent

### Typical Pedon

Orion silt loam, 0 to 2 percent slopes, in a cultivated field, 2,350 feet east and 400 feet north of the southwest corner of sec. 16, T. 98 N., R. 4 W.; U.S.G.S. Church, Iowa, Topographic Quadrangle; latitude 91 degrees, 19 minutes, and 13 seconds N. and longitude 43 degrees, 17 minutes, and 57 seconds W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 6/2) dry; weak medium and fine subangular blocky structure; friable; common very fine roots; mildly alkaline; abrupt smooth boundary.

C—8 to 28 inches; stratified dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), very dark grayish brown (10YR 3/2), and very dark gray (10YR 3/1) silt loam; common fine prominent strong brown (7.5YR 4/6) and few fine prominent dark brown (7.5YR 3/4) mottles; massive with horizontal cleavage resulting from stratification; friable; few very fine roots; mildly alkaline; abrupt smooth boundary.

2Ab1—28 to 35 inches; black (N 2/0) loam; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

2Ab2—35 to 49 inches; black (10YR 2/1) loam; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

2Ab3—49 to 54 inches; very dark gray (10YR 3/1) silt loam; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

2Bg—54 to 60 inches; dark gray (10YR 4/1) silt loam; common fine prominent strong brown (7.5YR 4/6) mottles; weak fine subangular blocky structure; friable; neutral.

### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Depth to 2Ab horizon:* 20 to 40 inches

*A or Ap horizon:*

Hue—10YR

Value—3 or 4

Chroma—1 or 2

Texture—silt loam

*C horizon:*

Hue—10YR

Value—2 to 5

Chroma—1 to 3

Texture—silt loam

*2Ab horizon:*

Hue—10YR, 2.5Y, or neutral

Value—2 or 3

Chroma—0 to 2  
Texture—silt loam, loam, or silty clay loam

**2Bg horizon:**

Hue—10YR or 2.5Y  
Value—4 or 5  
Chroma—1 to 3  
Texture—silt loam or silty clay loam

**930—Orion silt loam, 0 to 2 percent slopes**

**Composition**

Orion 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:* Somewhat poorly drained  
*Dominant parent material:* Local alluvium  
*Flooding:* Occasional  
*Depth to the water table:* 1 to 3 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 12.4 inches (high)  
*Organic matter content in 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**

- Arenzville 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

**5040—Orthents, loamy**

**Description**

- This map unit consists of nearly level to strongly sloping 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

**Otter Series**

*Drainage class:* Poorly drained  
*Permeability:* Moderate  
*Landscape:* Flood plains and uplands  
*Landform:* Flood plains  
*Parent material:* Alluvium  
*Native vegetation:* Prairie grasses and sedges  
*Slope range:* 0 to 2 percent

**Typical Pedon**

Otter silt loam, 0 to 2 percent slopes, in a pasture, 2,160 feet south and 125 feet east of the northwest corner of sec. 25, T. 99 N., R. 4 W.; U.S.G.S. Church, Iowa, Topographic Quadrangle; latitude 91 degrees, 16 minutes, and 18 seconds N. and longitude 43 degrees, 21 minutes, and 51 seconds W.

Ap—0 to 9 inches; black (N 2/0) silt loam, very dark gray (N 3/0) dry; moderate very fine and fine granular structure; friable; common medium and fine roots; neutral; clear smooth boundary.

A1—9 to 14 inches; black (N 2/0) silt loam, very dark gray (N 3/0) dry; few fine prominent strong brown (7.5YR 4/6 and 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; neutral; clear smooth boundary.

A2—14 to 25 inches; very dark grayish brown (2.5Y 3/2) and very dark gray (N 3/0) silt loam, gray (N 5/0) and dark grayish brown (2.5Y 4/2) dry; few medium prominent strong brown (7.5YR 4/6 and 5/8) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; neutral; clear smooth boundary.

Cg1—25 to 41 inches; olive gray (5Y 5/2) silt loam; few fine prominent strong brown (7.5YR 4/6) mottles; massive; friable; few fine roots; mildly alkaline; clear smooth boundary.

Cg2—41 to 60 inches; gray (5Y 5/1) silt loam; few fine distinct light olive brown (2.5Y 5/6) mottles in the upper part; massive; friable; some black (N 2/0), filled worm and root channels; mildly alkaline.

**Range in Characteristics**

*Depth to carbonates:* Greater than 60 inches  
*Depth to bedrock:* Greater than 60 inches

*Thickness of the mollic epipedon:* 24 to 40 inches

*A horizon:*

Hue—10YR, 7.5YR, 2.5Y, or neutral  
Value—2 or 3  
Chroma—0 to 2  
Texture—silt loam

*Bg horizon (if it occurs):*

Hue—10YR, 7.5YR, 2.5Y, or neutral  
Value—2 to 4  
Chroma—0 to 2  
Texture—silt loam

*Cg horizon:*

Hue—10YR, 2.5Y, 5Y, or neutral  
Value—2 to 6  
Chroma—0 to 3  
Texture—silt loam

### **487B—Otter-Worthen complex, 1 to 4 percent slopes**

#### ***Composition***

Otter and similar soils: About 50 percent  
Worthen and similar soils: About 45 percent  
Inclusions: About 5 percent

#### ***Setting***

*Landform:* Drainageways

*Slope:* Otter—0 to 2 percent; Worthen—2 to 4 percent

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

##### **Otter**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Poorly drained  
*Dominant parent material:* Local alluvium  
*Flooding:* Occasional  
*Seasonal high water table:* At the surface to 1 foot below the surface  
*Available water capacity to 60 inches or root-limiting layer:* About 12.6 inches (high)  
*Organic matter content in the surface layer:* About 4.5 percent (high)

##### **Worthen**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* 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 13.3 inches (high)  
*Organic matter content in 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***

- Somewhat 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

### **589—Otter silt loam, 0 to 2 percent slopes**

#### ***Composition***

Otter 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  
*Flooding:* Occasional  
*Seasonal high water table:* At the surface to 1 foot below the surface  
*Available water capacity to 60 inches or root-limiting layer:* About 12.6 inches (high)  
*Organic matter content in the surface layer:* About 6.5 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***

- Arenzville and similar soils
- Areas of recent stratified overwash

#### ***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

### **Paintcreek Series**

*Drainage class:* Well drained

*Permeability:* Slow

*Landscape:* Uplands

*Landform:* Hills

*Geomorphic component:* Side slopes and nose slopes

*Hillslope position:* Shoulders and back slopes

*Parent material:* Loess over pedisidiment underlain by residuum

*Native vegetation:* Deciduous trees

*Slope range:* 5 to 30 percent

#### **Typical Pedon**

Paintcreek silt loam, 9 to 14 percent slopes, moderately eroded, in a pasture, 75 feet west and 1,550 feet north of the southeast corner of sec. 7, T. 100 N., R. 4 W.; U.S.G.S. New Albin, Iowa, Topographic Quadrangle; latitude 91 degrees, 21 minutes, and 7 seconds N. and longitude 43 degrees, 29 minutes, and 53 seconds W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

BE—6 to 11 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; slightly acid; gradual wavy boundary.

Bt1—11 to 15 inches; strong brown (7.5YR 5/6) silty clay loam; moderate fine subangular blocky structure; friable; discontinuous distinct brown and dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; gradual smooth boundary.

2Bt2—15 to 24 inches; yellowish red (5YR 5/6) clay; moderate fine subangular blocky structure; friable; continuous distinct reddish brown (5YR 4/4) clay films on faces of peds; about 5 percent coarse fragments (2 to 7 centimeters); about 5 percent coarse fragments (8 to 25 centimeters); strongly acid; clear smooth boundary.

2Bt3—24 to 35 inches; red (2.5YR 4/6) clay; strong fine subangular blocky structure; firm; continuous distinct red (2.5YR 4/6) clay films on faces of peds; about 5 percent coarse fragments (2 to 7 centimeters); about 10 percent coarse fragments (8 to 25 centimeters); very strongly acid; clear wavy boundary.

2Bt4—35 to 43 inches; red (2.5YR 4/6) cobbly clay; strong fine subangular blocky structure; firm; continuous distinct reddish brown (2.5YR 4/4) clay films on faces of peds; continuous distinct black (10YR 2/1) manganese or iron-manganese coatings on faces of peds; about 5 percent coarse fragments (2 to 7 centimeters); about 25 percent coarse fragments (8 to 25 centimeters); about 5 percent coarse fragments (25 to 60 centimeters); very strongly acid; gradual wavy boundary.

3Bt5—43 to 60 inches; yellowish red (5YR 4/6) clay; weak fine subangular blocky structure; firm; continuous distinct yellowish red (5YR 4/6) clay films on faces of peds; continuous distinct black (10YR 2/1) manganese or iron-manganese coatings on faces of peds; about 5 percent coarse fragments (2 to 7 centimeters); about 10 percent coarse fragments (8 to 25 centimeters); about 5 percent coarse fragments (25 to 60 centimeters); very strongly acid.

#### **Range in Characteristics**

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Thickness of the loess:* 5 to 20 inches

*Ap or A horizon:*

Hue—10YR

Value—3 or 4 moist, 6 or 7 dry

Chroma—2 or 3

Texture—silt loam

*BE horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—silt loam

*Bt and 2Bt horizons:*

Hue—2.5YR to 7.5YR

Value—4 to 6

Chroma—4 to 6

Texture—silty clay loam, silty clay, or clay

*3C horizon (if it occurs):*

Hue—10YR, 7.5YR, or 5YR

Value—4 to 6

Chroma—4 to 6

Texture—stratified sandy loam, loam, sandy clay loam, sand, clay, or clay loam

### **912C—Paintcreek silt loam, 5 to 9 percent slopes**

#### **Composition**

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



**Setting**

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 5 to 9 percent

**Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over pedis sediment underlain by residuum

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 8.7 inches (moderate)

*Organic matter content in 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 eroded 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

**912D—Paintcreek silt loam, 9 to 14 percent slopes****Composition**

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

**Setting**

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 9 to 14 percent

**Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over pedis sediment underlain by residuum

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 8.7 inches (moderate)

*Organic matter content in 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 eroded 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

**912D2—Paintcreek silt loam, 9 to 14 percent slopes, moderately eroded****Composition**

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

**Setting**

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 9 to 14 percent

**Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over pedis sediment underlain by residuum

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 8.4 inches (moderate)

*Organic matter content in 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 uneroded 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

### **912E—Paintcreek silt loam, 14 to 18 percent slopes**

#### ***Composition***

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

#### ***Setting***

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 14 to 18 percent

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

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over pedisegment underlain by residuum

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 8.7 inches (moderate)

*Organic matter content in 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 eroded soils
- Soils that have bedrock at a depth of less than 60 inches

#### ***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

### **912E2—Paintcreek silt loam, 14 to 18 percent slopes, moderately eroded**

#### ***Composition***

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

#### ***Setting***

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 14 to 18 percent

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

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over pedisegment underlain by residuum

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 8.4 inches (moderate)

*Organic matter content in 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 severely eroded soils
- Soils that have bedrock at a depth of less than 60 inches

#### ***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

### 912F—Paintcreek silt loam, 18 to 30 percent slopes

#### **Composition**

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

#### **Setting**

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 18 to 30 percent

#### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over pedisidiment underlain by residuum

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 8.7 inches (moderate)

*Organic matter content in 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 bedrock at a depth of less than 60 inches

#### **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

### 5010—Pits, sand and gravel

#### **Description**

- This map unit consists of pits on stream terraces where sand and gravel have been removed.

### 5030—Pits, limestone quarries

#### **Description**

- This map unit consists of pits from which limestone has been removed.

### **Richwood Series**

*Drainage class:* Well drained

*Permeability:* Moderate

*Landscape:* Stream terraces

*Landform:* Terraces

*Geomorphic component:* Treads

*Parent material:* Silty alluvium

*Native vegetation:* Prairie grasses

*Slope range:* 0 to 5 percent

#### **Typical Pedon**

Richwood silt loam, 0 to 2 percent slopes, in a cultivated field, 200 feet west and 1,700 feet south of the northeast corner of sec. 32, T. 100 N., R. 5 W.; U.S.G.S. Waukon Northwest, Iowa, Topographic Quadrangle; latitude 91 degrees, 27 minutes, and 7 seconds N. and longitude 43 degrees, 26 minutes, and 17 seconds W.

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

A—10 to 16 inches; very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Bt1—16 to 27 inches; brown (10YR 4/3) silt loam; weak medium and fine subangular blocky structure; friable; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; few very fine roots; slightly acid; gradual smooth boundary.

Bt2—27 to 31 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium and fine subangular blocky structure; friable; thin continuous brown (10YR 4/3) clay films on faces of peds; few very fine roots; slightly acid; gradual smooth boundary.

Bt3—31 to 38 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; thin discontinuous brown (10YR 4/3) clay

films on faces of peds; patchy light gray (10YR 6/1 dry) silt coatings; few very fine roots; neutral; gradual smooth boundary.

BC—38 to 51 inches; dark yellowish brown (10YR 4/4) silt loam; few medium prominent reddish brown (5YR 4/4) mottles; weak fine prismatic structure parting to weak medium subangular blocky; friable; patchy light gray (10YR 6/1 dry) silt coatings; few very fine roots; neutral; clear smooth boundary.

C—51 to 60 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; patchy light gray (10YR 6/1 dry) silt coatings; neutral.

#### **Range in Characteristics**

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Ap and A horizons:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

*Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 to 5

Texture—silt loam or silty clay loam

*C horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 to 5

Texture—silt loam

### **977—Richwood silt loam, 0 to 2 percent slopes**

#### **Composition**

Richwood and similar soils: About 95 percent

Inclusions: About 5 percent

#### **Setting**

*Landform:* Terraces

*Slope:* 0 to 2 percent

#### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 12.5 inches (high)

*Organic matter content in 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**

- Moderately well drained 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

### **977B—Richwood silt loam, 2 to 5 percent slopes**

#### **Composition**

Richwood and similar soils: About 95 percent

Inclusions: About 5 percent

#### **Setting**

*Landform:* Terraces

*Slope:* 2 to 5 percent

#### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 12.5 inches (high)

*Organic matter content in 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**

- Festina 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

## 841G—Rock outcrop-Boone complex, 20 to 70 percent slopes

### Composition

Rock outcrop: About 50 percent  
Boone and similar soils: About 35 percent  
Inclusions: About 15 percent

### Setting

*Landform:* Hills  
*Position on landform:* Head slopes, nose slopes, and side slopes  
*Slope:* 20 to 70 percent

### Component Description

#### Rock outcrop

*Kind of material:* Unweathered sandstone bedrock  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet

#### Boone

*Surface layer texture:* Loamy sand  
*Depth to bedrock:* 20 to 40 inches  
*Drainage class:* Excessively drained  
*Dominant parent material:* Sandstone  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 2.0 inches (very low)  
*Organic matter content in the surface layer:* About 1 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

- Nordness 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

### Rowley Series

*Drainage class:* Somewhat poorly drained  
*Permeability:* Moderate  
*Landscape:* Stream terraces  
*Landform:* Terraces

*Geomorphic component:* Treads

*Parent material:* Silty alluvium

*Native vegetation:* Prairie grasses with scattered trees

*Slope range:* 0 to 2 percent

### Typical Pedon

Rowley silt loam, 0 to 2 percent slopes, in a cultivated field, 1,950 feet east and 1,850 feet south of the northwest corner of sec. 32, T. 100 N., R. 5 W.; U.S.G.S. Waukon Northwest, Iowa, Topographic Quadrangle; latitude 91 degrees, 27 minutes, and 51 seconds N. and longitude 43 degrees, 26 minutes, and 14 seconds W.

- Ap—0 to 11 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak medium and fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; gradual smooth boundary.
- A—11 to 18 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; gradual smooth boundary.
- AB—18 to 22 inches; mixed black (10YR 2/1), very dark gray (10YR 3/1), and dark grayish brown (10YR 4/2) silt loam, dark gray (10YR 4/1), gray (10YR 5/1), and grayish brown (10YR 5/2) dry; weak fine and very fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.
- Btg1—22 to 30 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine distinct dark yellowish brown (10YR 4/6) mottles; weak fine prismatic structure parting to moderate fine subangular blocky; friable; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; very patchy silt coatings on faces of peds; few very fine roots; slightly acid; gradual smooth boundary.
- Btg2—30 to 38 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct strong brown (7.5YR 4/6 and 5/6) mottles; moderate medium and fine prismatic structure parting to moderate medium and fine angular blocky; friable; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few fine roots; slightly acid; clear smooth boundary.
- BCg—38 to 46 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine distinct yellowish brown (10YR 5/6) and common medium prominent dark brown and brown (7.5YR 4/4) mottles; moderate medium prismatic structure; friable; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; very patchy light gray (10YR 7/1 dry) silt coatings; few fine and few very fine roots; slightly acid; clear smooth boundary.
- Cg—46 to 60 inches; mottled grayish brown (2.5Y 5/2),

yellowish brown (10YR 5/6), strong brown (7.5YR 4/6), and dark grayish brown (2.5Y 4/2) silt loam; massive; friable; few fine and few very fine roots; common very dark brown (10YR 2/2), soft accumulations of iron and manganese; slightly acid.

#### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Ap and A horizons:*

Hue—10YR

Value—2 or 3

Chroma—1 to 3

Texture—silt loam

*Btg horizon:*

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—2 to 4

Texture—silty clay loam or silt loam

*BC horizon:*

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—2 to 4

Texture—silt loam or silty clay loam

*C horizon:*

Hue—7.5YR, 10YR, or 2.5Y

Value—4 to 6

Chroma—2 to 6

Texture—silt loam

## 826—Rowley silt loam, 0 to 2 percent slopes

### Composition

Rowley and similar soils: About 95 percent

Inclusions: About 5 percent

### Setting

*Landform:* Terraces

*Slope:* 0 to 2 percent

### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat poorly drained

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 10.1 inches (high)

*Organic matter content in 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

- Richwood 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

### Sattre Series

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, very rapid in the lower part

*Landscape:* Stream terraces

*Landform:* Terraces

*Geomorphic component:* Treads

*Parent material:* Loamy alluvium over sand and gravel

*Native vegetation:* Mixed prairie grasses and deciduous trees

*Slope range:* 1 to 5 percent

### Typical Pedon

Sattre loam, 1 to 5 percent slopes, in a cultivated field, 2,150 feet west and 1,000 feet north of the southeast corner of sec. 10, T. 100 N., R. 4 W.; U.S.G.S. New Albin, Iowa, Topographic Quadrangle; latitude 91 degrees, 18 minutes, and 1 second N. and longitude 43 degrees, 29 minutes, and 17 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; dark yellowish brown (10YR 4/4) streaks and pockets (less than 5 percent); weak fine and very fine subangular blocky structure; friable; few very fine roots; slightly acid; abrupt smooth boundary.

Bt1—9 to 22 inches; dark yellowish brown (10YR 4/4) loam; weak fine prismatic structure parting to weak fine subangular blocky; friable; thin continuous brown and dark brown (10YR 4/3) clay films on faces of peds; few very fine roots; neutral; gradual smooth boundary.

Bt2—22 to 31 inches; dark yellowish brown (10YR 4/4) sandy clay loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; thin discontinuous brown and dark brown (10YR 4/3) clay films on faces of peds; few very fine roots;

neutral; clear smooth boundary.

2C1—31 to 39 inches; dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) loamy sand; massive; friable; few very fine roots; neutral; abrupt smooth boundary.

2C2—39 to 41 inches; brown and dark brown (7.5YR 4/4) sandy loam; massive; friable; neutral; abrupt smooth boundary.

2C3—41 to 49 inches; stratified dark yellowish brown (10YR 4/6) and brown and dark brown (7.5YR 4/4) loamy sand; massive; friable; neutral; clear smooth boundary.

2C4—49 to 54 inches; light yellowish brown (10YR 6/4) sand; single grained; loose; 2 percent fine gravel; neutral; abrupt wavy boundary.

2C5—54 to 60 inches; light yellowish brown (10YR 6/4) gravelly sand (about 25 percent gravel); single grained; loose; neutral.

#### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Depth to sand, gravel, or both:* 30 to 40 inches

*Ap or A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—loam

*Bt horizon:*

Hue—10YR or 7.5YR

Value—4

Chroma—3 or 4

Texture—loam or sandy clay loam

*2C horizon:*

Hue—10YR or 7.5YR

Value—4 to 6

Chroma—4 to 6

Texture—sand, gravelly sand, gravelly loamy sand, or sandy loam

### 778B—Sattre loam, 1 to 5 percent slopes

#### Composition

Sattre and similar soils: About 90 percent

Inclusions: About 10 percent

#### Setting

*Landform:* Terraces

*Slope:* 1 to 5 percent

#### Component Description

*Surface layer texture:* Loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loamy alluvium over sand and gravel

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 6.4 inches (moderate)

*Organic matter content in 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

- Waukee and similar soils
- Soils that have a surface layer of sandy loam or loamy sand

#### 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

### Shullsburg Series

*Drainage class:* Somewhat poorly drained

*Permeability:* Slow

*Landscape:* Uplands

*Landform:* Hills

*Geomorphic component:* Side slopes

*Hillslope position:* Shoulders and back slopes

*Parent material:* Loess over shale bedrock

*Native vegetation:* Prairie grasses and open forest

*Slope range:* 3 to 9 percent

#### Typical Pedon

Shullsburg silty clay loam, 3 to 9 percent slopes, in a cultivated field, 1,590 feet north and 1,350 feet east of the southwest corner of sec. 36, T. 99 N., R. 6 W.; U.S.G.S. Hanover, Iowa, Topographic Quadrangle; latitude 91 degrees, 30 minutes, and 20 seconds N. and longitude 43 degrees, 20 minutes, and 47 seconds W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 3/1) dry; weak medium and fine subangular blocky structure; friable; common very fine roots; neutral; clear smooth boundary.

A—10 to 13 inches; mixed very dark gray (10YR 3/1)

and very dark grayish brown (10YR 3/2) silty clay loam, dark gray (10YR 4/1) and grayish brown (10YR 5/2) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Btg1—13 to 18 inches; dark grayish brown (2.5Y 4/3 and 4/2) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; friable; continuous very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) clay films on faces of peds; few very fine roots; few fine black (10YR 2/1) accumulations; neutral; gradual smooth boundary.

Btg2—18 to 25 inches; dark grayish brown (2.5Y 4/3) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; friable; discontinuous very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) clay films on faces of peds; few very fine roots; few fine black (10YR 2/1) accumulations; neutral; gradual smooth boundary.

Btg3—25 to 29 inches; dark grayish brown (2.5Y 4/3) and olive brown (2.5Y 4/4) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; discontinuous very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) clay films on faces of peds; few very fine roots; few black (10YR 2/1) accumulations; neutral; clear smooth boundary.

2BCg—29 to 32 inches; dark grayish brown (2.5Y 4/3) and olive brown (2.5Y 4/4) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) clay accumulation at the contact of the shale; neutral; abrupt wavy boundary.

2Cr—32 inches; mottled greenish gray (5GY 6/1 and 5G 6/1) and yellowish brown (10YR 5/8 and 5/6) shale; massive; very firm.

#### Range in Characteristics

*Depth to bedrock:* 20 to 40 inches

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

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silty clay loam

*Btg horizon:*

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—2 to 4

Texture—silty clay loam or silt loam

*BC horizon:*

Hue—10YR, 2.5Y, or 5Y

Value—4 to 6

Chroma—2 to 6

Texture—silty clay loam or silt loam

## 206C—Shullsburg silty clay loam, 3 to 9 percent slopes

### Composition

Shullsburg and similar soils: About 95 percent

Inclusions: About 5 percent

### Setting

*Landform:* Hills

*Position on landform:* Head slopes, nose slopes, and side slopes

*Slope:* 3 to 9 percent

### Component Description

*Surface layer texture:* Silty clay loam

*Depth to bedrock:* 20 to 40 inches

*Drainage class:* Somewhat poorly drained

*Dominant parent material:* Loess over weathered shale

*Flooding:* None

*Seasonal high water table:* Perched at a depth of 1 to 3 feet

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

*Organic matter content in 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

- Massbach 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

### Sparta Series

*Drainage class:* Excessively drained

*Permeability:* Rapid



*Landscape:* Stream terraces

*Landform:* Terraces

*Geomorphic component:* Treads and risers

*Parent material:* Eolian sand

*Native vegetation:* Prairie grasses

*Slope range:* 2 to 14 percent

#### Typical Pedon

Sparta sand, 2 to 5 percent slopes, in a cultivated field, 2,400 feet north and 1,540 feet west of the southeast corner of sec. 28, T. 100 N., R. 4 W.; U.S.G.S. New Albin, Iowa, Topographic Quadrangle; latitude 91 degrees, 21 minutes, and 0 seconds N. and longitude 43 degrees, 26 minutes, and 55 seconds W.

Ap—0 to 10 inches; very dark brown (10YR 2/2) sand, dark grayish brown (10YR 4/2) dry; weak fine and very fine subangular blocky structure; very friable; common fine and few very fine roots; neutral; clear smooth boundary.

A—10 to 23 inches; very dark grayish brown (10YR 3/2) sand, grayish brown (10YR 5/2) dry; weak medium and fine subangular blocky structure; very friable; few very fine roots; neutral; gradual smooth boundary.

Bw1—23 to 29 inches; brown (10YR 4/3) sand; thin continuous very dark grayish brown (10YR 3/2) coatings on faces of peds; weak fine subangular blocky structure; very friable; few very fine roots; neutral; clear smooth boundary.

Bw2—29 to 38 inches; dark yellowish brown (10YR 4/4) sand; weak medium and fine subangular blocky structure; very friable; few very fine roots; slightly acid; clear smooth boundary.

C1—38 to 46 inches; yellowish brown (10YR 5/4) sand; dark yellowish brown (10YR 3/6) lamellae of loamy sand 3 to 5 millimeters thick; single grained; loose; few very fine roots; slightly acid; clear smooth boundary.

C2—46 to 60 inches; yellowish brown (10YR 5/6) sand; dark yellowish brown (10YR 4/4) lamellae of loamy sand 1 to 2 millimeters thick; single grained; loose; few very fine roots; slightly acid.

#### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Content of coarse sand in the solum:* 10 to 15 percent

*Ap and A horizons:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—loamy sand or sand

*Bw horizon:*

Hue—10YR or 7.5YR

Value—4 to 6

Chroma—3 to 6

Texture—loamy sand or sand

*C horizon:*

Hue—10YR or 7.5YR

Value—4 to 6

Chroma—3 to 6

Texture—sand

### 41B—Sparta sand, 2 to 5 percent slopes

#### Composition

Sparta and similar soils: 100 percent

#### Setting

*Landform:* Terraces

*Slope:* 2 to 5 percent

#### Component Description

*Surface layer texture:* Sand

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Excessively drained

*Dominant parent material:* Eolian sand

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 4.1 inches (low)

*Organic matter content in 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.

#### 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

### 41C—Sparta sand, 5 to 9 percent slopes

#### Composition

Sparta and similar soils: 100 percent

**Setting**

*Landform:* Terraces

*Slope:* 5 to 9 percent

**Component Description**

*Surface layer texture:* Sand

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Excessively drained

*Dominant parent material:* Eolian sand

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 4.1 inches (low)

*Organic matter content in the surface layer:* About 1 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.

**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

**41D—Sparta sand, 9 to 14 percent slopes****Composition**

Sparta and similar soils: 100 percent

**Setting**

*Landform:* Terraces

*Slope:* 9 to 14 percent

**Component Description**

*Surface layer texture:* Sand

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Excessively drained

*Dominant parent material:* Eolian sand

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 4.1 inches (low)

*Organic matter content in the surface layer:* About 1 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.

**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

**140B—Sparta loamy sand, 2 to 5 percent slopes****Composition**

Sparta and similar soils: 100 percent

**Setting**

*Landform:* Terraces

*Slope:* 2 to 5 percent

**Component Description**

*Surface layer texture:* Loamy sand

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Excessively drained

*Dominant parent material:* Eolian sand

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 5.3 inches (low)

*Organic matter content in 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.

**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

**140C—Sparta loamy sand, 5 to 9 percent slopes****Composition**

Sparta and similar soils: 100 percent

**Setting**

*Landform:* Terraces

*Slope:* 5 to 9 percent

**Component Description**

*Surface layer texture:* Loamy sand

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Excessively drained

*Dominant parent material:* Eolian sand

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 5.3 inches (low)

*Organic matter content in 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.

**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

**Spillville Series**

*Drainage class:* Somewhat poorly drained

*Permeability:* Moderate

*Landscape:* Flood plains

*Landform:* Flood plains

*Parent material:* Local alluvium

*Native vegetation:* Prairie grasses

*Slope range:* 0 to 2 percent

**Typical Pedon**

Spillville loam, 0 to 2 percent slopes, in a cultivated field, 1,150 feet west and 2,100 feet south of the northeast corner of sec. 8, T. 99 N., R. 6 W.; U.S.G.S. Dorchester, Iowa, Topographic Quadrangle; latitude 91 degrees, 34 minutes, and 29 seconds N. and longitude

43 degrees, 24 minutes, and 30 seconds W.

**Ap**—0 to 9 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; few very fine roots; slightly acid; clear smooth boundary.

**A1**—9 to 14 inches; black (10YR 2/1) and very dark grayish brown (10YR 3/2) loam, very dark gray (10YR 3/1) and grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

**A2**—14 to 20 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; few very fine roots; neutral; gradual smooth boundary.

**A3**—20 to 34 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; mildly alkaline; gradual smooth boundary.

**A4**—34 to 40 inches; very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; mildly alkaline; gradual smooth boundary.

**AB**—40 to 47 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) loam; weak medium and fine subangular blocky structure; friable; few very fine roots; mildly alkaline; gradual smooth boundary.

**Bw**—47 to 56 inches; dark grayish brown (10YR 4/2) loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium and fine subangular blocky structure; friable; few very fine roots; mildly alkaline; gradual smooth boundary.

**C**—56 to 60 inches; dark grayish brown (10YR 4/2) sandy clay loam; dark brown (10YR 3/3) coatings on faces of peds; massive; friable; about 5 percent gravel; strong effervescence; moderately alkaline.

**Range in Characteristics**

*Depth to carbonates:* 50 to more than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Thickness of the mollic epipedon:* Greater than 40 inches

**Ap and A horizons:**

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—loam

**Bw horizon:**

Hue—10YR

Value—4

Chroma—2

Texture—loam

*C horizon:*

Hue—10YR

Value—4

Chroma—2 or 3

Texture—loam or sandy clay loam

**485—Spillville loam, 0 to 2 percent slopes****Composition**

Spillville and similar soils: About 95 percent

Inclusions: About 5 percent

**Setting***Landform:* Flood plains*Slope:* 0 to 2 percent**Component Description***Surface layer texture:* Loam*Depth to bedrock:* Greater than 60 inches*Dominant parent material:* Local alluvium*Flooding:* Occasional*Depth to the water table:* 3 to 5 feet*Available water capacity to 60 inches or root-limiting layer:* About 11.5 inches (high)*Organic matter content in 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**

- Soil that have a surface layer of sandy loam

**Major Uses of the Unit**

- Cropland
- Hayland
- Pasture

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

- Agronomy section

**Tama Series***Drainage class:* Well drained*Permeability:* Moderate*Landscape:* Uplands*Landform:* Hills*Geomorphic component:* Divides, interfluves, side slopes, and head slopes*Hillslope position:* Summits, shoulders, and back slopes*Parent material:* Loess*Native vegetation:* Prairie grasses*Slope range:* 2 to 9 percent**Typical Pedon**

Tama silt loam, 2 to 5 percent slopes, in a cultivated field, 200 feet east and 2,300 feet south of the northwest corner of sec. 1, T. 97 N., R. 6 W.; U.S.G.S. Frankville, Iowa, Topographic Quadrangle; latitude 91 degrees, 30 minutes, and 23 seconds N. and longitude 43 degrees, 14 minutes, and 56 seconds W.

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

A—7 to 11 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak medium and fine subangular blocky structure parting to weak fine granular; friable; few very fine, few fine, and few medium roots; neutral; clear smooth boundary.

AB—11 to 18 inches; very dark grayish brown (10YR 3/2) silt loam; dark brown (10YR 4/3) mixings; black (10YR 2/1) coatings on faces of peds; weak fine and very fine subangular blocky structure; friable; few very fine, few fine, and few medium roots; neutral; clear smooth boundary.

Bt1—18 to 25 inches; dark brown (10YR 4/3) silty clay loam; very dark gray (10YR 3/1) mixings in the upper part; weak fine and very fine subangular blocky structure; friable; discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—25 to 31 inches; dark brown (10YR 4/3) silty clay loam; weak fine prismatic structure parting to weak fine subangular blocky; friable; few discontinuous dark brown (10YR 3/3) clay films on faces of peds; few very fine and few fine roots; strongly acid; clear smooth boundary.

BC—31 to 44 inches; dark brown (10YR 4/3) silty clay loam; weak medium prismatic structure parting to weak medium and fine subangular blocky; friable; few very fine and few fine roots; medium acid; clear smooth boundary.

C—44 to 60 inches; yellowish brown (10YR 5/4) silt loam; few fine and medium distinct strong brown (7.5YR 5.6) mottles; massive; friable; few very fine and few fine roots; strongly acid.

**Range in Characteristics***Depth to carbonates:* Greater than 60 inches*Depth to bedrock:* Greater than 60 inches*Thickness of the mollic epipedon:* 12 to 20 inches

**A horizon:**

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

**AB horizon:**

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

**Bt horizon:**

Hue—10YR  
 Value—4 or 5  
 Chroma—3 or 4  
 Texture—silty clay loam

**C horizon:**

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

**120B—Tama silt loam, 2 to 5 percent slopes****Composition**

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

**Setting**

*Landform:* Hills  
*Position on landform:* Summits and back slopes  
*Slope:* 2 to 5 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Loess  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 12.1 inches (high)  
*Organic matter content in 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**

- Downs 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

**120C—Tama silt loam, 5 to 9 percent slopes****Composition**

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

**Setting**

*Landform:* Hills  
*Position on landform:* Summits and back slopes  
*Slope:* 5 to 9 percent

**Component Description**

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Loess  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 12.1 inches (high)  
*Organic matter content in 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**

- Downs 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

**Village Series**

*Drainage class:* Well drained  
*Permeability:* Moderate in the upper part, slow in the lower part  
*Landscape:* Uplands  
*Landform:* Hills

*Geomorphic component:* Side slopes and nose slopes

*Hillslope position:* Shoulders and back slopes

*Parent material:* Loess over residuum

*Native vegetation:* Deciduous trees

*Slope range:* 5 to 25 percent

### Typical Pedon

Village silt loam, 9 to 14 percent slopes, moderately eroded, in a cultivated field, 680 feet west and 460 feet south of the northeast corner of sec. 25, T. 100 N., R. 5 W.; U.S.G.S. New Albin, Iowa, Topographic Quadrangle; latitude 91 degrees, 22 minutes, and 27 seconds N. and longitude 43 degrees, 27 minutes, and 22 seconds W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; about 5 percent dark yellowish brown (10YR 4/4) streaks and pockets; weak fine subangular blocky structure; friable; many medium roots; neutral; clear wavy boundary.

BE—6 to 10 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; many medium roots; neutral; gradual smooth boundary.

Bt1—10 to 16 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; thin discontinuous brown and dark brown (10YR 4/3) clay films on faces of peds; common fine roots; slightly acid; gradual smooth boundary.

Bt2—16 to 23 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; thin continuous distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few discontinuous black (10YR 2/1) manganese or iron-manganese coatings on faces of peds; common fine roots; medium acid; clear smooth boundary.

Bt3—23 to 26 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; thin continuous distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few discontinuous black (10YR 2/1) manganese or iron-manganese coatings on faces of peds; few fine roots; medium acid; clear smooth boundary.

2Bt4—26 to 31 inches; yellowish brown (10YR 5/6), dark yellowish brown (10YR 4/4), and strong brown (7.5YR 5/6) silty clay loam; strong coarse angular blocky structure; friable; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few discontinuous very dark grayish brown (10YR 3/2) manganese or iron-manganese coatings; few fine roots; 2 percent channers;

medium acid; gradual smooth boundary.

2Bt5—31 to 36 inches; brown and dark brown (7.5YR 4/4) clay loam; few fine distinct yellowish red (5YR 5/6) mottles; moderate medium angular blocky structure; friable; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; discontinuous very dark grayish brown (10YR 3/2) manganese or iron-manganese coatings; few medium roots; 2 percent channers and 2 percent cobbles; medium acid; clear smooth boundary.

2Bt6—36 to 44 inches; reddish brown (5YR 4/4) clay; few medium distinct light olive brown (2.5Y 5/3) mottles; weak coarse angular blocky structure parting to weak fine subangular blocky; firm; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; few discontinuous black (10YR 2/1) manganese or iron-manganese coatings; few medium roots; 2 percent channers and 2 percent cobbles; neutral; gradual smooth boundary.

2Bt7—44 to 50 inches; 90 percent reddish brown (5YR 4/4) and 10 percent yellowish red (5YR 5/8) clay and sandy clay; weak coarse prismatic structure; firm; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; few discontinuous black (10YR 2/1) manganese or iron-manganese coatings; few medium roots; 2 percent channers and 2 percent cobbles; neutral; gradual smooth boundary.

2Bt8—50 to 57 inches; 50 percent brown and dark brown (7.5YR 4/4) and 50 percent yellowish brown (10YR 5/8) clay and silty clay loam; weak coarse prismatic structure; firm; thin discontinuous reddish brown (5YR 4/4) clay films on upper surfaces of peds and stones; few discontinuous black (10YR 2/1) manganese or iron-manganese coatings; few medium roots; 2 percent channers and 2 percent cobbles; neutral; gradual smooth boundary.

2Bt9—57 to 60 inches; 50 percent brown and dark brown (7.5YR 4/4) and 50 percent brown and dark brown (7.5YR 4/2) sandy clay loam; weak coarse prismatic structure; firm; few discontinuous reddish brown (5YR 4/4) clay bridges between sand grains; 5 to 10 percent sandstone fragments; slightly acid.

### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Thickness of the loess:* 20 to 40 inches

*Ap or A horizon:*

Hue—10YR

Value—2 to 4 moist, 6 or more dry

Chroma—2 or 3

Texture—silt loam

*Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 to 6

Texture—silt loam or silty clay loam

*2Bt horizon:*

Hue—10YR, 7.5YR, 5YR, or 2.5YR

Value—4 or 5

Chroma—2 to 8

Texture—dominantly clay or silty clay

**837C—Village silt loam, 5 to 9 percent slopes*****Composition***

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

***Setting****Landform:* Hills*Position on landform:* Back slopes and foot slopes*Slope:* 5 to 9 percent***Component Description****Surface layer texture:* Silt loam*Depth to bedrock:* Greater than 60 inches*Drainage class:* Well drained*Dominant parent material:* Loess over residuum*Flooding:* None*Depth to the water table:* Greater than 6.0 feet*Available water capacity to 60 inches or root-limiting layer:* About 10.1 inches (high)*Organic matter content in 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 substratum of sandy loam
- Areas of eroded 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

**837C2—Village silt loam, 5 to 9 percent slopes, moderately eroded*****Composition***

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

***Setting****Landform:* Hills*Position on landform:* Back slopes and foot slopes*Slope:* 5 to 9 percent***Component Description****Surface layer texture:* Silt loam*Depth to bedrock:* Greater than 60 inches*Drainage class:* Well drained*Dominant parent material:* Loess over residuum*Flooding:* None*Depth to the water table:* Greater than 6.0 feet*Available water capacity to 60 inches or root-limiting layer:* About 9.9 inches (high)*Organic matter content in 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 uneroded soils
- Soils that have a substratum of sandy loam

***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

**837D—Village silt loam, 9 to 14 percent slopes*****Composition***

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

***Setting****Landform:* Hills*Position on landform:* Back slopes and foot slopes

*Slope:* 9 to 14 percent

### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over residuum

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 10.1 inches (high)

*Organic matter content in 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 eroded soils
- Soils that have a substratum of sandy loam

### **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

## **837D2—Village silt loam, 9 to 14 percent slopes, moderately eroded**

### **Composition**

Village and similar soils: About 90 percent

Inclusions: About 10 percent

### **Setting**

*Landform:* Hills

*Position on landform:* Back slopes and foot slopes

*Slope:* 9 to 14 percent

### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over residuum

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 9.9 inches (high)

*Organic matter content in 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 uneroded soils
- Soils that have a substratum of sandy loam

### **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

## **837E—Village silt loam, 14 to 18 percent slopes**

### **Composition**

Village and similar soils: About 90 percent

Inclusions: About 10 percent

### **Setting**

*Landform:* Hills

*Position on landform:* Back slopes and foot slopes

*Slope:* 14 to 18 percent

### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loess over residuum

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 10.1 inches (high)

*Organic matter content in 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***

- Paintcreek and similar soils
- Areas of eroded 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

**837E2—Village silt loam, 14 to 18 percent slopes, moderately eroded*****Composition***

Village and similar soils: About 85 percent  
Inclusions: About 15 percent

***Setting***

*Landform:* Hills  
*Position on landform:* Back slopes and foot slopes  
*Slope:* 14 to 18 percent

***Component Description***

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Loess over residuum  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 9.9 inches (high)  
*Organic matter content in 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***

- Paintcreek and similar soils
- Areas of severely eroded soils
- Areas of uneroded 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

**837F—Village silt loam, 18 to 25 percent slopes*****Composition***

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

***Setting***

*Landform:* Hills  
*Position on landform:* Back slopes and foot slopes  
*Slope:* 18 to 25 percent

***Component Description***

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Loess over residuum  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 10.1 inches (high)  
*Organic matter content in 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***

- Paintcreek and similar soils
- Areas of eroded 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

***Volney Series***

*Drainage class:* Somewhat excessively drained  
*Permeability:* Moderately rapid in the upper part, very rapid in the lower part

*Landscape:* Uplands and flood plains

*Landform:* Alluvial fans, drainageways, and flood plains

*Parent material:* Alluvium

*Native vegetation:* Prairie grasses

*Slope range:* 0 to 9 percent

#### Typical Pedon

Volney channery loam, 2 to 5 percent slopes, in a pasture, 1,300 feet west and 150 feet south of the northeast corner of sec. 20, T. 99 N., R. 5 W.; U.S.G.S. Waukon Northwest, Iowa, Topographic Quadrangle; latitude 91 degrees, 27 minutes, and 21 seconds N. and longitude 43 degrees, 23 minutes, and 5 seconds W.

A1—0 to 6 inches; black (10YR 2/1) channery loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; about 20 percent channers; slight effervescence; moderately alkaline; gradual wavy boundary.

A2—6 to 14 inches; black (10YR 2/1) flaggy loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; about 20 percent flags and 10 percent channers; slight effervescence; moderately alkaline; gradual wavy boundary.

A3—14 to 31 inches; black (10YR 2/1) very channery loam, very dark gray (10YR 3/1) dry; weak very fine subangular blocky structure; friable; about 45 percent channers; slight effervescence; moderately alkaline; gradual wavy boundary.

A4—31 to 48 inches; very dark gray (10YR 3/1) very channery loam; discontinuous black (10YR 2/1) coatings on faces of peds; moderate fine subangular blocky structure; friable; about 50 percent channers; slight effervescence; moderately alkaline; gradual wavy boundary.

A5—48 to 60 inches; very dark gray (10YR 3/1) loam; discontinuous black (10YR 2/1) coatings on faces of peds; moderate medium prismatic structure; about 10 percent channers; friable; slight effervescence; moderately alkaline.

#### Range in Characteristics

*Depth to carbonates:* 0 to 10 inches

*Depth to bedrock:* Greater than 60 inches

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—flaggy, channery, or very channery loam

*C horizon (if it occurs):*

Hue—10YR

Value—2 to 4

Chroma—2 or 3

Texture—channery or very channery loam or silt loam

### 196B—Volney channery loam, 2 to 5 percent slopes

#### Composition

Volney and similar soils: About 95 percent

Inclusions: About 5 percent

#### Setting

*Landform:* Drainageways

*Slope:* 2 to 5 percent

#### Component Description

*Surface layer texture:* Channery loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Alluvium

*Flooding:* Occasional

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

*Available water capacity to 60 inches or root-limiting layer:* About 3.6 inches (low)

*Organic matter content in 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

- Areas of recent stratified overwash

#### 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

### 196C—Volney channery loam, 5 to 9 percent slopes

#### Composition

Volney and similar soils: 100 percent

#### Setting

*Landform:* Drainageways

*Slope:* 5 to 9 percent

#### Component Description

*Surface layer texture:* Channery loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Somewhat excessively drained

*Dominant parent material:* Alluvium

*Flooding:* Occasional

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

*Available water capacity to 60 inches or root-limiting layer:* About 3.6 inches (low)

*Organic matter content in 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.

### **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

### **Waukee Series**

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, very rapid in the lower part

*Landscape:* Stream terraces

*Landform:* Terraces

*Geomorphic component:* Treads

*Parent material:* Loamy alluvium over sand and gravel

*Native vegetation:* Prairie grasses

*Slope range:* 1 to 5 percent

#### **Typical Pedon**

Waukee loam, 1 to 5 percent slopes, in a cultivated field, 575 feet north and 1,700 feet east of the southwest corner of sec. 13, T. 97 N., R. 3 W.; U.S.G.S. Harpers Ferry, Iowa, Topographic Quadrangle; latitude 91 degrees, 8 minutes, and 42 seconds N. and longitude 43 degrees, 12 minutes, and 43 seconds W.

Ap—0 to 9 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; slightly acid; gradual smooth boundary.

A—9 to 17 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

BA—17 to 22 inches; very dark grayish brown (10YR 3/2) and very dark brown (10YR 3/3) loam, grayish brown (10YR 5/2) dry; weak medium subangular

blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Bw1—22 to 30 inches; dark brown and brown (10YR 4/3) loam; continuous very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium subangular blocky structure; friable; few very fine roots; slightly acid; clear smooth boundary.

Bw2—30 to 33 inches; dark brown and brown (10YR 4/3) sandy clay loam; dark brown (10YR 3/3) coatings on faces of peds; weak fine subangular blocky structure; friable; few very fine roots; slightly acid; clear smooth boundary.

2BC—33 to 36 inches; dark brown and brown (10YR 4/3) and dark yellowish brown (10YR 4/4) gravelly loamy sand (about 20 percent gravel); weak fine subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.

2C1—36 to 49 inches; dark yellowish brown (10YR 4/4) very gravelly sand (about 60 percent gravel); single grained; loose; slightly acid; gradual smooth boundary.

2C2—49 to 60 inches; yellowish brown (10YR 5/4) sand (about 10 percent gravel); single grained; loose; slightly acid.

#### **Range in Characteristics**

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Depth to sand, gravel, or both:* 24 to 40 inches

*Ap and A horizons:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—loam

*Bw horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 to 6

Texture—loam or sandy clay loam

*2BC and 2C horizons:*

Hue—10YR or 7.5YR

Value—4 to 6

Chroma—3 to 6

Texture—gravelly loamy sand, loamy sand, sand, or gravelly sand

### **178B—Waukee loam, 1 to 5 percent slopes**

#### **Composition**

Waukee and similar soils: 100 percent

#### **Setting**

*Landform:* Terraces

*Slope:* 1 to 5 percent

### **Component Description**

*Surface layer texture:* Loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Loamy alluvium over sand and gravel

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 7.6 inches (moderate)

*Organic matter content in 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

### **Worthen Series**

*Drainage class:* Well drained

*Permeability:* Moderate

*Landscape:* Uplands

*Landform:* Hills and drainageways

*Geomorphic component:* Base slopes

*Hillslope position:* Foot slopes

*Parent material:* Silty local alluvium

*Native vegetation:* Prairie grasses

*Slope range:* 2 to 7 percent

#### **Typical Pedon**

Worthen silt loam, 2 to 7 percent slopes, in a cultivated field, 240 feet west and 50 feet north of the center of sec. 23, T. 96 N., R. 6 W.; U.S.G.S. Postville, Iowa, Topographic Quadrangle; latitude 91 degrees, 31 minutes, and 9 seconds N. and longitude 43 degrees, 7 minutes, and 5 seconds W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; clear smooth boundary.

A1—7 to 15 inches; very dark gray (10YR 3/1) silt loam,

grayish brown (10YR 5/2) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; abrupt smooth boundary.

A2—15 to 22 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak medium and fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; neutral; clear smooth boundary.

A3—22 to 34 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

BA—34 to 39 inches; mixed brown or dark brown (10YR 4/3) and very dark grayish brown (10YR 3/2) silt loam; thin discontinuous very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium and fine subangular blocky structure; friable; few very fine roots; neutral; clear smooth boundary.

Bw—39 to 48 inches; dark yellowish brown (10YR 4/4) silt loam; thin discontinuous brown or dark brown (10YR 4/3) coatings on faces of peds; weak medium prismatic structure parting to weak medium subangular blocky; friable; few very fine roots; neutral; gradual smooth boundary.

BC—48 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; thin discontinuous brown or dark brown (10YR 4/3) coatings on faces of peds; few fine distinct light brownish gray (10YR 6/2) and few fine distinct brown or dark brown (7.5YR 4/6) mottles; weak medium prismatic structure; friable; neutral.

#### **Range in Characteristics**

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Thickness of the mollic epipedon:* 24 to 40 inches

*Ap or A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 to 3

Texture—silt loam

*Bw horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—silt loam

### **981B—Worthen silt loam, 2 to 7 percent slopes**

#### **Composition**

Worthen and similar soils: About 90 percent

Inclusions: About 10 percent

### Setting

*Landform:* Hills

*Slope:* 2 to 7 percent

### Component Description

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Flooding:* None

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

*Available water capacity to 60 inches or root-limiting layer:* About 13.3 inches (high)

*Organic matter content in 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

- Richwood and similar soils
- Soils that have a surface layer of loam

### Major Uses of the Unit

- Cropland
- Hayland
- Pasture

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

- Agronomy section

### Yellowriver Series

*Drainage class:* Well drained

*Permeability:* Moderate

*Landscape:* Uplands

*Landform:* Hills

*Geomorphic component:* Base slopes

*Hillslope position:* Foot slopes

*Parent material:* Slope alluvium

*Native vegetation:* Deciduous trees

*Slope range:* 9 to 40 percent

### Typical Pedon

Yellowriver silt loam, 18 to 25 percent slopes, in a wooded pasture, 1,080 feet west and 700 feet north of the southeast corner of sec. 33, T. 99 N., R. 3 W.; U.S.G.S. Lansing, Iowa, Topographic Quadrangle; latitude 91 degrees, 11 minutes, and 46 seconds N. and longitude 43 degrees, 20 minutes, and 34 seconds W.

A—0 to 5 inches; very dark gray (10YR 3/1) silt loam (32 percent sand), gray (10YR 5/1) dry; moderate

medium and fine granular structure; friable; common fine and few medium roots; mildly alkaline; clear smooth boundary.

E—5 to 12 inches; brown (10YR 4/3) silt loam (30 percent sand); weak thin to thick platy structure; friable; few medium and few fine roots; mildly alkaline; clear smooth boundary.

BE—12 to 18 inches; dark yellowish brown (10YR 4/4) silt loam (18 percent sand); weak medium and fine subangular blocky structure; friable; faint very pale brown (10YR 7/3 dry) silt coatings on faces of peds; few fine roots; mildly alkaline; clear smooth boundary.

Bt1—18 to 26 inches; dark yellowish brown (10YR 4/4) silt loam (13 percent sand); weak medium and fine subangular blocky structure; friable; thin discontinuous brown (10YR 4/3) clay films on faces of peds; faint very pale brown (10YR 7/3 dry) silt coatings on faces of peds; few fine roots; mildly alkaline; clear smooth boundary.

2Bt2—26 to 40 inches; dark yellowish brown (10YR 4/4) silt loam (8 percent sand); moderate medium and fine subangular blocky structure; friable; thin discontinuous brown (10YR 4/3) clay films on faces of peds; faint very pale brown (10YR 7/3 dry) silt coatings on faces of peds; few fine roots; neutral; clear smooth boundary.

2Bt3—40 to 48 inches; yellowish brown (10YR 5/6) silt loam (6 percent sand); weak medium subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine black (10YR 2/1) iron or manganese oxides; few fine roots; neutral; clear smooth boundary.

2C—48 to 60 inches; dark yellowish brown (10YR 4/4) and strong brown (10YR 4/6) silt loam (6 percent sand); massive; friable; few fine black (10YR 2/1) iron or manganese oxides; neutral.

### Range in Characteristics

*Depth to carbonates:* Greater than 60 inches

*Depth to bedrock:* Greater than 60 inches

*Thickness of loamy sediments:* 20 to 48 inches

*Percent sand in loamy sediments:* 10 to 50 inches

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

*Ap horizon (if it occurs):*

Hue—10YR

Value—4

Chroma—2 or 3

Texture—silt loam

*E horizon:*

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—silt loam or silty clay loam

*C horizon:*

Hue—10YR or 7.5YR  
 Value—4 to 6  
 Chroma—4 to 6  
 Texture—silt loam

**861D—Yellowriver silt loam, 9 to 14 percent slopes*****Composition***

Yellowriver and similar soils: About 85 percent  
 Inclusions: About 15 percent

***Setting***

*Landform:* Hills  
*Position on landform:* Back slopes and foot slopes  
*Slope:* 9 to 14 percent

***Component Description***

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Slope alluvium  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 11.6 inches (high)  
*Organic matter content in 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 eroded soils
- Soils that have a surface layer of sandy loam
- Churchtown 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

**861D2—Yellowriver silt loam, 9 to 14 percent slopes, moderately eroded*****Composition***

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

***Setting***

*Landform:* Hills  
*Position on landform:* Back slopes and foot slopes  
*Slope:* 9 to 14 percent

***Component Description***

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Slope alluvium  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 11.6 inches (high)  
*Organic matter content in 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 eroded soils
- Soils that have a surface layer of sandy loam

***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

**861E—Yellowriver silt loam, 14 to 18 percent slopes****Composition**

Yellowriver and similar soils: About 85 percent  
Inclusions: About 15 percent

**Setting**

*Landform:* Hills

*Position on landform:* Back slopes and foot slopes

*Slope:* 14 to 18 percent

**Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Slope alluvium

*Flooding:* None

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

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

*Organic matter content in 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 eroded soils
- Churchtown and similar soils
- Soils that have a substratum of sandy loam

**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

**861E2—Yellowriver silt loam, 14 to 18 percent slopes, moderately eroded****Composition**

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

**Setting**

*Landform:* Hills

*Position on landform:* Back slopes and foot slopes

*Slope:* 14 to 18 percent

**Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Slope alluvium

*Flooding:* None

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

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

*Organic matter content in 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 bedrock at a depth of less than 60 inches
- Soils that have a surface layer of sandy loam

**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

**861F—Yellowriver silt loam, 18 to 25 percent slopes****Composition**

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

**Setting**

*Landform:* Hills

*Position on landform:* Back slopes and foot slopes

*Slope:* 18 to 25 percent

**Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Well drained

*Dominant parent material:* Slope alluvium

*Flooding:* None

*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 11.6 inches (high)  
*Organic matter content in 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 bedrock at a depth of less than 60 inches
- Soils that have a surface layer of sandy loam

#### ***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

### **861G—Yellowriver silt loam, 25 to 40 percent slopes**

#### ***Composition***

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

#### ***Setting***

*Landform:* Hills  
*Position on landform:* Back slopes and foot slopes  
*Slope:* 25 to 40 percent

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

*Surface layer texture:* Silt loam  
*Depth to bedrock:* Greater than 60 inches  
*Drainage class:* Well drained  
*Dominant parent material:* Slope alluvium  
*Flooding:* None  
*Depth to the water table:* Greater than 6.0 feet  
*Available water capacity to 60 inches or root-limiting layer:* About 11.6 inches (high)  
*Organic matter content in 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 surface layer of sandy loam

#### ***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

### ***Zwingle Series***

*Drainage class:* Poorly drained  
*Permeability:* Very slow  
*Landscape:* Stream terraces  
*Landform:* Terraces  
*Geomorphic component:* Treads  
*Parent material:* Lacustrine  
*Native vegetation:* Deciduous trees  
*Slope range:* 1 to 9 percent

#### ***Typical Pedon***

Zwingle silt loam, 1 to 9 percent slopes, in a pasture, 1,240 feet west and 710 feet north of the southeast corner of sec. 30, T. 98 N., R. 2 W.; U.S.G.S. Ferryville, Wisconsin, Topographic Quadrangle—Iowa; latitude 91 degrees, 6 minutes, and 59 seconds N. and longitude 43 degrees, 16 minutes, and 12 seconds W.

- A—0 to 3 inches; very dark gray (10YR 3/1) silt loam, light gray (10YR 6/1) dry; weak fine granular structure; friable; common very fine roots; neutral; clear smooth boundary.
- E1—3 to 8 inches; light brownish gray (10YR 6/2) silt loam; weak thin platy structure; friable; many fine black (10YR 2/1) iron or manganese oxides; few very fine roots; slightly acid; clear smooth boundary.
- E2—8 to 11 inches; light brownish gray (10YR 6/2) silt loam; weak thin platy structure parting to weak fine subangular blocky; friable; common fine black (10YR 2/1) iron or manganese oxides; few very fine roots; medium acid; clear smooth boundary.
- Btg1—11 to 16 inches; pinkish gray (7.5YR 6/2) silty clay loam; moderate fine subangular blocky structure; firm; thin continuous pinkish gray (7.5YR 6/2) clay films on faces of peds; few fine black (10YR 2/1) iron or manganese oxides; few very fine roots; medium acid; clear smooth boundary.
- Btg2—16 to 23 inches; pinkish gray (7.5YR 6/2) clay; moderate medium subangular blocky structure; firm; thin continuous pinkish gray (7.5YR 6/2) clay films on faces of peds; few very fine roots; medium acid; abrupt smooth boundary.



Btg3—23 to 28 inches; reddish brown (5YR 4/3) clay; moderate fine subangular blocky structure; firm; thin continuous brown (7.5YR 4/3) clay films on faces of peds; few very fine roots; medium acid; clear smooth boundary.

Btg4—28 to 35 inches; reddish brown (5YR 4/4) clay; few fine distinct brown (10YR 5/3) mottles; weak fine and medium subangular blocky structure; firm; thin continuous reddish brown (5YR 4/3) clay films on faces of peds; few very fine roots; medium acid; abrupt smooth boundary.

Btg5—35 to 41 inches; brown (7.5YR 4/4) clay; few coarse distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; firm; thin discontinuous brown (7.5YR 4/3) clay films on faces of peds; many fine black (10YR 2/1) iron or manganese oxides in a 1-inch band at the top of the horizon; neutral; abrupt smooth boundary.

C1—41 to 50 inches; light gray (10YR 6/1), stratified silt loam; many medium prominent strong brown (7.5YR 5/6) and few medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; mildly alkaline; abrupt smooth boundary.

C2—50 to 60 inches; mottled brown (7.5YR 4/4) and light gray (10YR 6/1), stratified silt loam and clay; massive; friable; common medium soft masses of lime; strong effervescence, moderately alkaline.

#### Range in Characteristics

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

*Depth to bedrock:* Greater than 60 inches

#### *Ap or A horizon:*

Hue—10YR

Value—3 or 4

Chroma—1 or 2

Texture—silt loam

#### *Btg horizon:*

Hue—5YR to 2.5Y

Value—4 to 6

Chroma—2 to 6

Texture—clay or silty clay

#### *C horizon:*

Hue—5YR to 2.5Y

Value—4 to 6

Chroma—2 to 6

Texture—silty clay to silt loam

### 249C—Zwingle silt loam, 1 to 9 percent slopes

#### **Composition**

Zwingle and similar soils: About 95 percent

Inclusions: About 5 percent

#### **Setting**

*Landform:* Terraces

*Slope:* 1 to 9 percent

#### **Component Description**

*Surface layer texture:* Silt loam

*Depth to bedrock:* Greater than 60 inches

*Drainage class:* Poorly drained

*Dominant parent material:* Lacustrine deposits

*Flooding:* None

*Seasonal high water table:* Perched at the surface to 1 foot below the surface

*Available water capacity to 60 inches or root-limiting layer:* About 8.2 inches (moderate)

*Organic matter content in 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 darker surface layer

#### **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



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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 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

**Back slope.** The geomorphic component that forms the steepest inclined surface and principal element of

many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes 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.

**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.

**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.

**Bottom land.** The normal flood plain of a stream, subject to flooding.

**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.

**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 fragments.** If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles 2 millimeters to 38 centimeters (15 inches) long.

**Coarse textured soil.** Sand or loamy sand.

**Cobblestone (or cobble).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

**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 in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

**Concretions.** Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

**Conservation 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.*—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a “wire” when rolled between thumb and forefinger.

*Sticky.*—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

*Hard.*—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

*Soft.*—When dry, breaks into powder or individual grains under very slight pressure.

*Cemented.*—Hard; little affected by moistening.

**Contour stripcropping (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.

**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.

**Drainage class** (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

*Excessively drained.*—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

*Somewhat excessively drained.*—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

*Well drained.*—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

*Moderately well drained.*—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

*Somewhat poorly drained.*—Water is removed slowly enough that the soil is wet for significant

periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

*Poorly drained.*—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

*Very poorly drained.*—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

**Drainage, surface.** Runoff, or surface flow of water, from an area.

**Drumlin.** A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

**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, for example, fire, that exposes the surface.

**Erosion pavement.** A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

**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 is not a source of gravel or sand for construction purposes.

**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.
- Foot slope.** The geomorphic component that forms the inner, gently inclined surface at the base of a hill slope. The surface is dominantly concave. In terms of gradational processes, a foot slope is a transition zone between an upslope site of erosion (back slope) and a downslope site of deposition (toe slope).
- 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.
- Fragipan.** A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.
- Frost action** (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.
- Genesis, soil.** The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.
- 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** (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.
- Glacial till** (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.
- Glaciofluvial deposits.** 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 up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.
- Gravelly soil material.** Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.
- Green manure crop** (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.
- Ground water.** 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.

**Hemic soil material (mucky peat).** Organic soil material intermediate in degree of decomposition between the less decomposed fibric 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 are as follows:

*O horizon.*—An organic layer of fresh and decaying plant residue.

*A horizon.*—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

*E horizon.*—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

*B horizon.*—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than

those in the A horizon; or (4) a combination of these.

*C horizon.*—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

*Cr horizon.*—Soft, consolidated bedrock beneath the soil.

*R layer.*—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

**Humus.** The well decomposed, more or less stable part of the organic matter in mineral soils.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

**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

**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 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. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common, and many*; size—*fine, medium, and coarse*; and contrast—*faint, distinct, and prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).
- Muck.** Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)
- 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.
- 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.

**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.

**Pedimentation.** 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 affecting the specified use.

**Permeability.** The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow .....	less than 0.06 inch
Slow .....	0.06 to 0.2 inch
Moderately slow .....	0.2 to 0.6 inch
Moderate .....	0.6 inch to 2.0 inches
Moderately rapid.....	2.0 to 6.0 inches
Rapid .....	6.0 to 20 inches
Very rapid .....	more than 20 inches

**Phase, soil.** A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

**pH value.** A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

**Piping** (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

**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. Common 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.

**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 .....	below 4.5
Very strongly acid .....	4.5 to 5.0
Strongly acid.....	5.1 to 5.5
Medium acid .....	5.6 to 6.0
Slightly acid.....	6.1 to 6.5
Neutral .....	6.6 to 7.3
Mildly alkaline.....	7.4 to 7.8
Moderately alkaline.....	7.9 to 8.4
Strongly alkaline .....	8.5 to 9.0
Very strongly alkaline .....	9.1 and higher

**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 groundwater 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 or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

**Shale.** Sedimentary rock formed by the hardening of a clay deposit.

**Sheet erosion.** The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

**Shoulder.** The hillslope position that forms the uppermost inclined surface near the top of a hillslope. It comprises the transition zone from back slope to summit. The surface is dominantly convex in profile and erosional in origin.

**Shrink-swell.** The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and

other structures. It can also damage plant roots.

**Silica.** A combination of silicon and oxygen. The mineral form is called quartz.

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Siltstone.** Sedimentary rock made up of dominantly silt-sized particles.

**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.

**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 grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Stubble mulch.** Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from 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, exhibiting a nearly level surface. A general term for the top, or highest, level of a landform, such as a hill, a mountain, or tableland. It generally 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 about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

**Surface soil.** The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

**Swale.** A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine due to uneven glacial deposition.

**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).** A layer of otherwise suitable soil

material that is 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.

**Toe slope.** The outermost inclined surface at the base of a hill. Toe slopes 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.

**Trace elements.** Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

**Upland (geology).** Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

**Valley fill.** In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

**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.