United States Department of Agriculture

NRCS

Natural Resources Conservation Service

Iowa Department of Agriculture and Land Stewardship

IOWA STATE UNIVERSITY
Iowa Agriculture and Home Economics Experiment Station

IOWA STATE UNIVERSITY
University Extension

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

Soil Survey of Cedar County, Iowa

Part I

How To Use This Soil Survey

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

On the **general soil map**, the survey area is divided into groups of soils called associations. 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 soil associations on the color-coded map legend, and then refer to the section **General Soil Map Units** in Part I for a general description of the soils in your area.

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

To find information about your area of interest, locate that area on the **Index to Map Sheets** in Part III. 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. The **Contents** in Part I lists the map units and shows the page where each map unit is described.

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

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

Major fieldwork for this soil survey was completed in 2007. Soil names and descriptions were approved in 2008. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2007. The most current official data are available through the NRCS Web Soil Survey (http://soils.usda.gov).

This survey was made cooperatively by the Natural Resources Conservation Service; the Iowa Agriculture and Home Economics Experiment Station and Cooperative Extension Service, Iowa State University; the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship; and Cedar County. The survey is part of the technical assistance furnished to the Cedar County Soil and Water Conservation District.

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.

Cover: A typical rural landscape in Cedar County.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at http://www.nrcs.usda.gov.

Contents

Issued 2009

Foreword

Soil surveys contain information that affects land use planning in survey areas. They include predictions of soil behavior for selected land uses. The surveys highlight soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

Soil surveys are designed for many different users. Farmers, foresters, and agronomists can use the surveys 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 surveys 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 surveys to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. 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 map unit is shown on the detailed soil maps. Each soil in the survey area is described, and information on specific uses is given. 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.

Richard Sims
State Conservationist
Natural Resources Conservation Service

Soil Survey of
Cedar County, Iowa

By Ryan P. Dermody, Natural Resources Conservation Service

Fieldwork by Ryan P. Dermody, Mark R. La Van, Mark J. Minger, Douglas B. Oelmann, and Jason E. Steele, Natural Resources Conservation Service

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

Cedar County is in east-central Iowa (fig. 1). It has an area of 372,700 acres, or about 582 square miles. It is bounded on the west by Linn and Johnson Counties, on the east by Clinton and Scott Counties, on the north by Jones County, and on the south by Muscatine County. Tipton is the county seat. It is in the central part of the county, about 130 miles east of Des Moines.

This survey updates the survey of Cedar County published in 1979 (Schermerhorn and others, 1979). It provides additional information and has larger maps, which show the soils in greater detail.

How This Survey Was Made

This survey was made to provide updated information about the soils and miscellaneous areas in the survey area, which is in Major Land Resource Areas 108C and 104. Major land resource areas (MLRAs) are geographically associated land resource units that share a common land use, elevation, topography, climate, water, soils, and vegetation (USDA/NRCS, 2006). Cedar County is a subset of MLRA 108C, Illinois and Iowa Deep Loess and Drift, West-Central Part, and MLRA 104, Eastern Iowa and Minnesota Till Prairies.

The information in this survey includes a description of the soils and miscellaneous areas and their location and a discussion of their properties and the subsequent effects on suitability, limitations, and management for specified uses. During the fieldwork for this survey, 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.

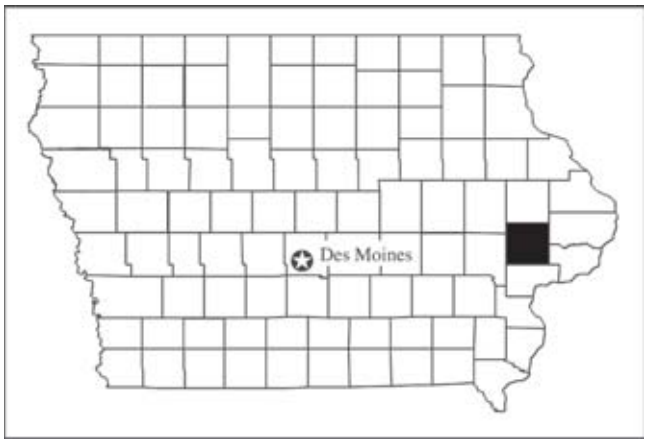

Figure 1.—Location of Cedar County in Iowa.

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 observed. The maximum depth of observation was about 80 inches (6.7 feet). Soil scientists noted soil 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. Interpretations are modified as necessary 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 water table within certain depths in most years, but they cannot predict that the 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 may not fully agree with those of the soils in adjacent survey areas. Differences are the result of an improved 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

This section provides general information about the survey area. It describes history, agriculture, industry, transportation facilities, recreation, physiography, drainage, geology, and climate.

History

Cedar County is named for the Cedar River, which was originally called “Mos-wah-wak-wah” (meaning redcedar) by the Native Americans because of the redcedar trees growing along the banks. Cedar County was created in 1837 by the Territorial Legislature. The county was formerly a part of Dubuque County. The first permanent European settlers arrived in the summer of 1836. In 1838, Rochester was considered the most important settlement and was made the county seat. In 1839, a petition was submitted to the Territorial Legislature to establish a more central location for the county seat. A commission of three men from outside the county was appointed to select a new site for the county seat. On March 14, 1840, after visiting many existing settlements, the commissioners arrived at the center of the county. One of the commissioners took a stake and drove it into the ground. On that stake the name of Tipton was written, in honor of General Tipton of Indiana. Since then, Tipton has remained the county seat of Cedar County.

The abolitionist John Brown and the Underground Railroad played an important part in the history of Cedar County. John Brown first came to Cedar County in 1856 after learning that the Quakers in West Branch held strong anti-slavery views. From then on, many communities in Cedar County had stations on the Underground Railroad. Many of the known stops still exist and can still be seen in West Branch, Springdale, and Tipton and on farms along Sugar Creek. In 1857, John Brown returned to Cedar County with his group of followers. He and his followers spent the winter of 1857 and 1858 on the William Maxson farm north of Springdale, drilling and preparing for his attack on Harpers Ferry in Virginia (now West Virginia). This attack was a critical event leading up to the Civil War. A boulder with a bronze plaque marking the Maxson farm was placed in 1924 north of Springdale.

On August 10, 1874, Herbert Hoover, the 31st President of the United States of America, was born in West Branch. Herbert Hoover was the first United States

President born west of the Mississippi River. West Branch is now home to the Herbert Hoover National Historic Site, Presidential Library, and Museum, which consists of 187 acres and is administered by the National Park Service. Herbert and Mrs. Hoover are buried on a hillside overlooking the President's birthplace on the park grounds.

Agriculture

In 2006, Cedar County had 950 farms with a total of 336,000 acres of farmland (USDA, 2006). Cropland planted to corn accounted for 145,500 acres, and cropland planted to soybeans totaled 119,000 acres. The rest of the farmland was hay, oats, and pasture.

Livestock operations include cow/calf herds, dairy herds, cattle feedlots, hog confinements, and sheep/lamb herds. In 2002, Cedar County had 312 cattle farms with an inventory of 22,194 feeder cattle and calves and 9,229 beef cows (U.S. Department of Commerce, 2002). The county had twelve dairy farms with 479 milk cows. Also, 108 farms had a total inventory of 141,678 hogs and pigs. There were 58 farms with 2,382 sheep and lambs. The county had 30 farms with a total of 715 laying hens and 13 farms with a total of 761 broiler chickens.

Specialty crops make up a minor part of the agriculture business in Cedar County. These crops include vegetables and fruit. A few farms raise exotic livestock, such as llamas, elk, bighorn sheep, and buffalo.

Industry

Industry in Cedar County is a mixture of agriculture, health care, retail enterprises, transportation, and tourism. Many residents commute to Iowa City, Cedar Rapids, Muscatine, or Davenport to work in manufacturing, health care, and education.

Transportation Facilities

Interstate 80 runs east and west through the southern part of Cedar County (fig. 2), and U.S. Highway 30 crosses the northern part. State Highway 38 runs north and south and bisects Cedar County down the center. The Herbert Hoover Highway (HHH), designated in 1923, links the Lincoln Highway (now Highway 30) to U.S. Highway 32 in Iowa City. The HHH runs through Iowa City, West Branch, Tipton, and Lowden.

Two railroads operate in Cedar County. One parallels Highway 30 and connects the towns of Lowden, Clarence, Stanwood, and Mechanicsville. The other travels through Durant, enters Muscatine County, and reenters Cedar County north of West Liberty on its way to Downey.

Recreation

The Cedar County Conservation Board manages 13 parks and wildlife areas throughout the county. Bennett Park has a small lake, a playground, electrical and primitive camping areas, and picnic areas. Cedar Valley Park has a boat ramp, camping areas, two shelter houses, limestone bluffs, and an abandoned limestone quarry for fishing. In addition to the public parks, there are a number of private camping parks throughout the county. The National Park Service manages the Herbert Hoover National Historic Site, which includes the presidential library and museum. There are hiking trails and bike paths through the park, and the museum sponsors many traveling displays and other events.

Figure 2.—Interstate 80 in Cedar County. Pictured is an area of map unit 4946, Udorthents-Highway complex, 0 to 5 percent slopes.

Physiography

Cedar County has a gently rolling to steep upland terrain, deeply dissected in places by rivers and streams. The areas immediately north and south of the Cedar and Wapsipinicon Rivers are characterized by an intricate pattern of deep valleys and ravines that have steep slopes. Small streams extend into the uplands.

The bottom lands along the Cedar and Wapsipinicon Rivers are nearly level. Stream terraces along the rivers are nearly level to undulating. Upland hills rise 100 to 200 feet from the level of the flood plains.

The northern one-fourth of Cedar County has a gently undulating topography that is called the Iowan Erosion Surface.

A broad dissected plain that makes up the largest part of Cedar County separates the Cedar and Wapsipinicon Rivers. It is characterized by slopes of less than 9 percent.

Drainage

Cedar County has two major rivers within its borders. The Cedar River enters along the west border with Johnson County (fig. 3). The river then flows in a southeast direction and exits on the southern border just north of the town of Moscow. The Cedar River makes an interesting 90 degree turn to the southwest after leaving Cedar County because of a particularly hard outcropping of limestone along the border with Muscatine County. The Wapsipinicon River enters Cedar County in the extreme northeast part of the county from Jones County. It flows through Cedar County for only a few miles before it enters Clinton County.

Figure 3.—Major flooding south of Cedar Bluffs along the Cedar River.

Geology

By Deborah J. Quade, Iowa Geological Survey.

Cedar County is in east-central Iowa near the boundary of the Southern Iowa Drift Plain and the Iowan Erosion Surface to the north. This area was glaciated numerous times between 2.2 million and 500,000 years ago (Hallberg, 1980b). Early researchers believed there were only two episodes of Pre-Illinoian glaciation in Iowa: the Kansan and Nebraskan. Later regional studies determined that at least seven episodes of Pre-Illinoian glaciation occurred during this time (Boellstorff, 1978a; Boellstorff, 1978b; Hallberg, 1980b; Hallberg, 1986). Regionally extensive upland units were not deposited in the survey area between 500,000 and 300,000 years ago. During this period several episodes of landscape development resulted in the formation of an integrated drainage network, slope evolution, and soil development on stable land surfaces (Bettis, 1989).

Hallberg (1980a) noted that Illinoian-age glacial ice did not advance as far west as the present survey area. Subsequent erosion and drainage development created a landscape of steeply rolling hills and integrated drainage networks characteristic of the Southern Iowa Drift Plain. These Pre-Illinoian glacial deposits are mantled by Wisconsin-age eolian materials. The Iowan Surface comprises approximately the northern third of Cedar County and is characterized by landscapes forming a complex mosaic of broadly stepped Wisconsin erosional surfaces cut into Pre-Illinoian Quaternary sequences, Wisconsin and Holocene alluvial surfaces, Wisconsin and Holocene eolian landforms, and intermittent areas of Paleozoic bedrock exposure.

In eastern Iowa, the highly eroded and dissected Pre-Illinoian upland and older terraces are mantled by Wisconsin loesses of variable thickness (Ruhe, 1969; Prior, 1976). These sediments are the youngest regionally extensive Quaternary deposits

and were deposited between 30,000 and 12,000 years ago. Loess is thickest in the region near the boundary of the Iowan Erosion Surface and near local sources (Cedar River valley). Two loess units were deposited across eastern Iowa: the older Pisgah Formation and the younger Peoria Loess. The Pisgah is thin and includes loess and related slope sediments that have been altered by colluvial hillslope processes and pedogenic and periglacial processes. The unit is characterized by the presence of a weakly developed soil recognized as the Farmdale Geosol. It is not uncommon to see the Farmdale developed throughout the Pisgah and incorporated into the underlying older Sangamon Geosol. Most likely the Pisgah loess was deposited on the eastern Iowa landscape from 30,000 to 24,000 years ago (Bettis, 1989). The Pisgah Formation is typically buried by Peoria Formation loess. The Peoria Formation loess accumulated on stable land surfaces in eastern Iowa from 25,000 to 21,000 years ago. This period was followed by a period of intense cold during the Wisconsin full glacial episode from 21,000 to 16,500 years ago (Bettis, 1989). The intense cold and the ensuing upland erosion led to the development of the distinctive landform recognized as the Iowan Erosion Surface (Prior, 1976). A periglacial environment prevailed during this period with intensive freeze-thaw action, solifluction, strong winds, and a host of other periglacial processes (Walters, 1996). As a result of this environment, surface soils were removed from the Iowan Erosion Surface and the Pre-Illinoian till surface was significantly eroded, which in turn resulted in the development of a region-wide colluvial lag deposit referred to as a "stone line." Other common features of this region are pahas, which are isolated and uneroded topographic highs of loess-mantled Pre-Illinoian till. These elongated or elliptical ridges have a directional orientation from northwest to southeast and exist as erosional outliers of the once higher and older landscape. Other common features are ice-wedge casts, which developed in the colluvial sediments and stone lines. The ice wedges are remnants of ice-wedge polygons that formed in frozen sediments (permafrost) during this period of intense cold. Thick packages of stratified loamy and sandy sediments located low on the upland landscape and adjacent to streams are remnants of solifluction lobes dating to this period. The depositional history of the Iowan Surface was under great debate for an extended period of time. Early researchers believed the Iowan Surface was a separate glaciation occurring sometime between the Illinoian and Wisconsin episodes. Later work disproved this idea and determined that erosional processes controlled the landscape development (Ruhe and others, 1968). Hallberg and others (1978) revisited the Iowan Erosion Surface to further research studies into the mechanisms behind the formation of the erosion surface, to reiterate Ruhe's classic work on stepped erosion surfaces, and to illustrate the need for continued research in the area. Beyond the Iowan Erosion Surface, the Peoria Loess continued to accumulate until 13,000 B.P., and in some parts of the Iowan Erosion Surface, a thin increment of loess accumulated as the climate ameliorated approximately 14,000 to 12,000 years ago.

The bedrock geology of Cedar County is characterized by widespread Silurian and Devonian carbonate strata as well as several small outliers of Pennsylvanian siliciclastic strata. Numerous bedrock exposures are displayed in the valley of the Cedar River and its tributaries (fig. 4), and numerous quarries have been developed within Silurian units in the county.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Tipton in the period from 1971 to 2000. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season.

Figure 4.—Limestone bluffs along the Cedar River in Cedar Valley County Park.

In winter, the average temperature is 21.7 degrees F and the average daily minimum temperature is 12.7 degrees. The lowest temperature during the period of record, which occurred on February 3, 1996, is -30 degrees. In summer, the average temperature is 71 degrees and the average daily maximum temperature is 82.3 degrees. The highest temperature, which occurred on July 12, 1936, is 108 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The average annual total precipitation is 36.59 inches. Of this total, 20.96 inches, or about 57 percent, usually falls in May through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall on record was 6.57 inches at Tipton on June 26, 1944. Thunderstorms occur on about 45 days each year, and most occur in June.

The average seasonal snowfall is 25.4 inches. The greatest snow depth at any one time was 26 inches recorded on February 11 and 12, 1905. On an average, 38 days per year have at least 1 inch of snow on the ground.

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 50 percent in winter. The prevailing wind is from the northwest. Average windspeed is highest, 12 miles per hour, in April.

Table 1.--Temperature and Precipitation

(Recorded in the period 1971-2000 at Tipton, Iowa)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	27.0	8.6	17.8	54	-21	0	1.22	0.58	1.79	3	7.1
February---	33.0	14.7	23.9	61	-17	0	1.41	.34	2.52	3	5.7
March------	46.0	26.0	36.0	78	-1	20	2.30	.95	3.48	5	2.9
April------	59.8	36.7	48.3	86	16	92	3.60	1.93	5.10	6	1.3
May--------	71.8	48.5	60.2	91	31	325	4.47	2.32	6.48	8	.0
June-------	80.9	58.2	69.5	95	42	585	4.40	2.28	6.43	7	.0
July-------	84.1	61.9	73.0	98	47	713	3.93	1.92	5.71	6	.0
August-----	81.8	59.4	70.6	96	44	636	4.61	2.24	6.74	6	.0
September--	75.0	50.4	62.7	93	30	386	3.55	1.64	5.48	6	.0
October----	63.3	38.8	51.1	86	20	131	2.68	1.12	4.09	5	.1
November---	46.1	27.3	36.7	71	4	16	2.52	.98	4.09	5	1.8
December---	32.0	14.9	23.4	59	-15	1	1.90	.80	2.75	4	6.5
Yearly:											
Average---	58.4	37.1	47.8	---	---	---	---	---	---	---	---
Extreme---	103	-30	---	98	-22	---	---	---	---	---	---
Total-----	---	---	---	---	---	2,905	36.59	29.68	42.68	64	25.4

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

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1971-2000 at Tipton, Iowa)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 17	Apr. 22	May 14
2 years in 10 later than--	Apr. 13	Apr. 18	May 8
5 years in 10 later than--	Apr. 6	Apr. 11	Apr. 27
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 12	Sept. 28	Sept. 22
2 years in 10 earlier than--	Oct. 18	Oct. 3	Sept. 26
5 years in 10 earlier than--	Oct. 28	Oct. 12	Oct. 4

Table 3.--Growing Season

(Recorded in the period 1971-2000 at Tipton, Iowa)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	187	166	137
8 years in 10	193	172	144
5 years in 10	204	183	159
2 years in 10	215	195	173
1 year in 10	221	201	181

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. These broad areas are called associations. Each association 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 association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils 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 association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

1. Fayette-Downs Association

Extent of the association in the survey area: 28 percent

Component Description

Fayette and similar soils
Extent: 59 percent of the association
Position on the landscape: Ridgetops, shoulders, and side slopes
Slope range: 2 to 40 percent
Texture of the surface layer: Silt loam
Depth to a restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 1.2 percent

Downs and similar soils
Extent: 16 percent of the association
Position on the landscape: Ridgetops, shoulders, and side slopes
Slope range: 2 to 18 percent
Texture of the surface layer: Silt loam
Depth to a restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year

Ponding: None
Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 2.6 percent

Soils of Minor Extent

Colo and similar soils
Extent: 9 percent of the association

Chelsea and similar soils
Extent: 6 percent of the association

Nodaway and similar soils
Extent: 6 percent of the association

Tama and similar soils
Extent: 4 percent of the association

2. Tama-Downs-Muscatine Association (fig. 5)

Extent of the association in the survey area: 45 percent

Component Description

Tama and similar soils
Extent: 48 percent of the association
Position on the landscape: Ridgetops, shoulders, and side slopes
Slope range: 2 to 14 percent
Texture of the surface layer: Silty clay loam
Depth to a restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None

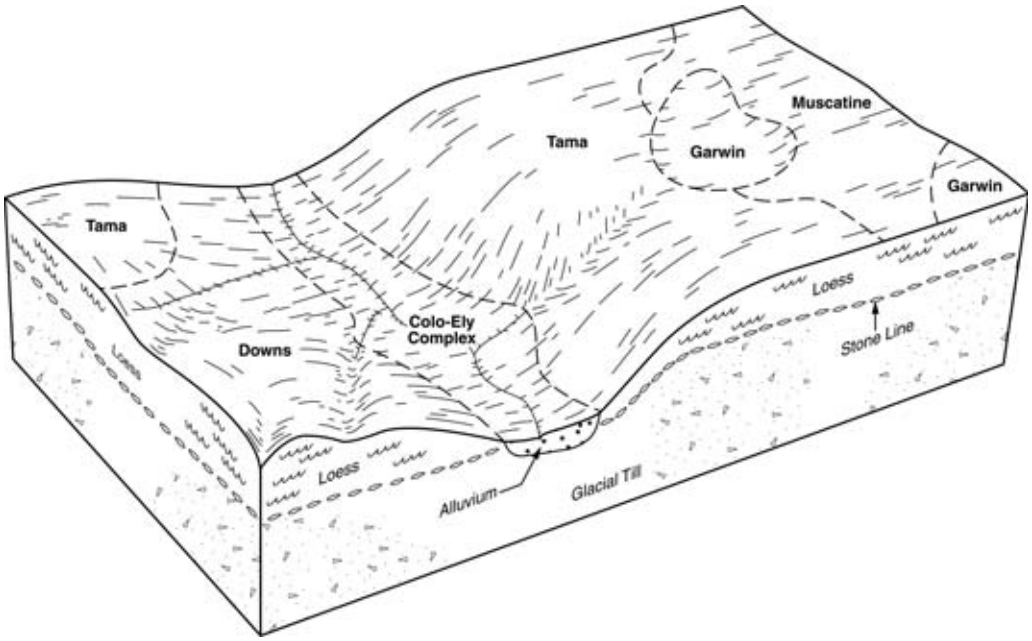

Figure 5.—Typical pattern of soils and underlying material in the Tama-Downs-Muscatine association.

Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Downs and similar soils
Extent: 16 percent of the association
Position on the landscape: Ridgetops, shoulders, and side slopes
Slope range: 2 to 18 percent
Texture of the surface layer: Silt loam
Depth to a restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.6 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Muscatine and similar soils (including the poorly drained Garwin soils)
Extent: 15 percent of the association
Position on the landscape: Summits and slight rises on upland flats
Slope range: 0 to 5 percent
Texture of the surface layer: Silty clay loam
Depth to a restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess
Flooding: None
Shallowest depth to wet zone: 1 foot (April)
Deepest depth to wet zone: 4 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.2 inches
Content of organic matter in the upper 10 inches: 5.0 percent

Soils of Minor Extent

Colo and similar soils
Extent: 11 percent of the association

Ely and similar soils
Extent: 6 percent of the association

Atterberry and similar soils
Extent: 4 percent of the association

3. Atterberry-Tama-Muscatine Association (fig. 6)

Extent of the association in the survey area: 3 percent

Component Description

Atterberry and similar soils (including Walford and Sperry soils)
Extent: 35 percent of the association
Position on the landscape: Upland flats
Slope range: 0 to 5 percent
Texture of the surface layer: Silt loam
Depth to a restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained

Parent material: Loess
Flooding: None
Shallowest depth to wet zone: 1 foot (April)
Deepest depth to wet zone: 4 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 2.5 percent

Tama and similar soils
Extent: 32 percent of the association
Position on the landscape: Ridgetops, shoulders, and side slopes
Slope range: 0 to 5 percent
Texture of the surface layer: Silt loam
Depth to a restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Muscatine and similar soils (including the poorly drained Garwin soils)
Extent: 23 percent of the association
Position on the landscape: Summits and slight rises on upland flats
Slope range: 0 to 5 percent
Texture of the surface layer: Silty clay loam
Depth to a restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess

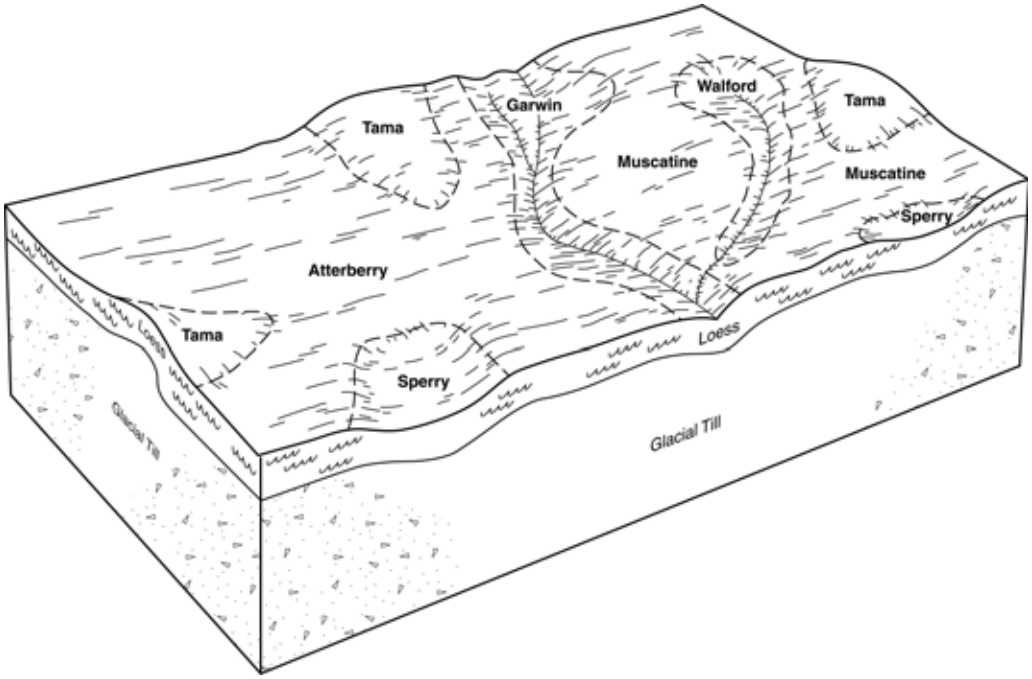

Figure 6.—Typical pattern of soils and underlying material in the Atterberry-Tama-Muscatine association.

Flooding: None
Shallowest depth to wet zone: 1 foot (April)
Deepest depth to wet zone: 4 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.2 inches
Content of organic matter in the upper 10 inches: 5.0 percent

Soils of Minor Extent

Colo and similar soils
Extent: 5 percent of the association

Ely and similar soils
Extent: 5 percent of the association

4. Dinsdale-Klinger-Maxfield Association (fig. 7)

Extent of the association in the survey area: 18 percent

Component Description

Dinsdale and similar soils
Extent: 28 percent of the association
Position on the landscape: Shoulders and side slopes
Slope range: 2 to 9 percent
Texture of the surface layer: Silty clay loam
Depth to a restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: 4 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 4.0 percent

Klinger and similar soils
Extent: 17 percent of the association
Position on the landscape: Summits and slight rises on upland flats
Slope range: 1 to 3 percent
Texture of the surface layer: Silty clay loam
Depth to a restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: 1 foot (April)
Deepest depth to wet zone: 4 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 4.8 percent

Maxfield and similar soils
Extent: 16 percent of the association
Position on the landscape: Upland flats
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to a restrictive feature: Very deep (more than 60 inches)

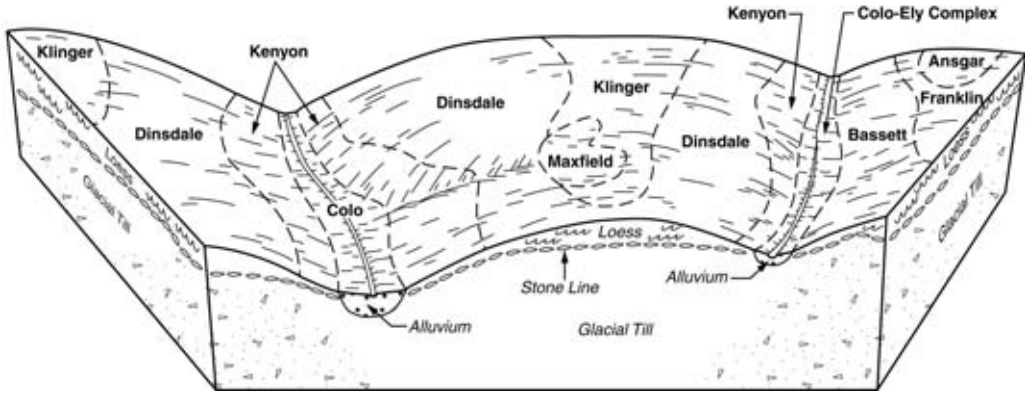

Figure 7.—Typical pattern of soils and underlying material in the Dinsdale-Klinger-Maxfield association.

Drainage class: Poorly drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.6 inches
Content of organic matter in the upper 10 inches: 6.6 percent

Soils of Minor Extent

Franklin and similar soils (including Ansgar soils)
Extent: 11 percent of the association

Kenyon and similar soils
Extent: 7 percent of the association

Mt. Carroll and similar soils
Extent: 6 percent of the association

Bassett and similar soils
Extent: 5 percent of the association

Colo and similar soils
Extent: 5 percent of the association

Ely and similar soils
Extent: 5 percent of the association

5. Colo-Perks-Spillville Association

Extent of the association in the survey area: 6 percent

Component Description

Colo and similar soils
Extent: 31 percent of the association
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to a restrictive feature: Very deep (more than 60 inches)

Drainage class: Poorly drained
Parent material: Silty alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.6 inches
Content of organic matter in the upper 10 inches: 5.5 percent

Perks and similar soils
Extent: 20 percent of the association
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loamy sand
Depth to a restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Frequent (February, March, April, May, June, July, August, September, October, November)
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 2.2 inches
Content of organic matter in the upper 10 inches: 0.9 percent

Spillville and similar soils
Extent: 15 percent of the association
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to a restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Frequent (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1 foot (April)
Deepest depth to wet zone: 4 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 4.1 percent

Soils of Minor Extent

Tama, terrace, and similar soils
Extent: 13 percent of the association

Atterberry, terrace, and similar soils
Extent: 11 percent of the association

Aquents, frequently flooded, ponded, and similar soils
Extent: 5 percent of the association

Ely and similar soils
Extent: 5 percent of the association

Detailed Soil Map Units

The map units delineated on the detailed soil maps in 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.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils 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 minor components that belong to taxonomic classes other than those of the major soils.

Most minor 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, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. 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 contrasting components are mentioned in the map unit descriptions. A few areas of minor components 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 minor components 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 landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, 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 and lists some of the principal soil properties that should be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. The soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, 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, Tama silty clay loam, 5 to 9 percent slopes, moderately eroded, is a phase of the Tama 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. Colo-Ely 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. The map unit Pits, sand and gravel, is an example.

The table “Acreage and Proportionate Extent of the Soils” in Part II lists the map units in this survey area. Other tables provided in Part II 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.

8B—Judson silty clay loam, 2 to 5 percent slopes

Component Description

Judson and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Footslopes and alluvial fans
Slope range: 2 to 5 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Silty colluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 13.2 inches
Content of organic matter in the upper 10 inches: 4.3 percent

Minor Dissimilar Components

Ely and similar soils
Extent: 0 to 10 percent of the unit

41B—Sparta loamy fine sand, 2 to 5 percent slopes

Component Description

Sparta and similar soils
Extent: 100 percent of the unit
Position on the landscape: Summits and ridgetops
Slope range: 2 to 5 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy eolian deposits
Flooding: None

Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.2 inches
Content of organic matter in the upper 10 inches: 1.5 percent

41C—Sparta loamy fine sand, 5 to 9 percent slopes

Component Description

Sparta and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Shoulders and summits
Slope range: 5 to 9 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.2 inches
Content of organic matter in the upper 10 inches: 1.5 percent

Minor Dissimilar Components

Chelsea and similar soils
Extent: 5 to 15 percent of the unit

Pillot and similar soils
Extent: 0 to 10 percent of the unit

41E—Sparta loamy fine sand, 9 to 18 percent slopes

Component Description

Sparta and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 18 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.2 inches
Content of organic matter in the upper 10 inches: 1.5 percent

Minor Dissimilar Components

Chelsea and similar soils
Extent: 0 to 10 percent of the unit

Dickinson and similar soils
Extent: 0 to 10 percent of the unit

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

Component Description

Chelsea and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Summits, ridgetops, and treads on stream terraces
Slope range: 2 to 5 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 4.4 inches
Content of organic matter in the upper 10 inches: 0.4 percent

Minor Dissimilar Components

Fayette and similar soils
Extent: 5 to 15 percent of the unit

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

Component Description

Chelsea and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Shoulders, summits, and risers on stream terraces
Slope range: 5 to 9 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 4.4 inches
Content of organic matter in the upper 10 inches: 0.4 percent

Minor Dissimilar Components

Fayette and similar soils
Extent: 5 to 15 percent of the unit

63E—Chelsea loamy fine sand, 9 to 18 percent slopes

Component Description

Chelsea and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 18 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained

Parent material: Sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 4.4 inches
Content of organic matter in the upper 10 inches: 0.4 percent

Minor Dissimilar Components

Fayette and similar soils
Extent: 0 to 10 percent of the unit

65D2—Lindley loam, 9 to 14 percent slopes, moderately eroded

Component Description

Lindley, moderately eroded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Subglacial till
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 9.3 inches
Content of organic matter in the upper 10 inches: 1.3 percent

Minor Dissimilar Components

Ely and similar soils
Extent: 0 to 10 percent of the unit

Lindley, severely eroded, and similar soils
Extent: 0 to 10 percent of the unit

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

Component Description

Lindley, moderately eroded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Side slopes
Slope range: 14 to 18 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Subglacial till
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None

Available water capacity to a depth of 60 inches: 9.3 inches
Content of organic matter in the upper 10 inches: 1.3 percent

Minor Dissimilar Components

Ely and similar soils
Extent: 0 to 10 percent of the unit

Lindley, severely eroded, and similar soils
Extent: 0 to 10 percent of the unit

65F2—Lindley loam, 18 to 25 percent slopes, moderately eroded

Component Description

Lindley, moderately eroded, and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Side slopes
Slope range: 18 to 25 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Subglacial till
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 9.3 inches
Content of organic matter in the upper 10 inches: 1.3 percent

Minor Dissimilar Components

Lindley, severely eroded, and similar soils
Extent: 5 to 15 percent of the unit

Keswick, moderately eroded, and similar soils
Extent: 0 to 10 percent of the unit

83B—Kenyon loam, 2 to 5 percent slopes

Component Description

Kenyon and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: More than 6.7 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Dinsdale and similar soils
Extent: 5 to 15 percent of the unit

Klinger and similar soils
Extent: 0 to 10 percent of the unit

83C—Kenyon loam, 5 to 9 percent slopes

Component Description

Kenyon and similar soils
Extent: 75 to 85 percent of the unit
Position on the landscape: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Dinsdale and similar soils
Extent: 5 to 15 percent of the unit

Kenyon, moderately eroded, and similar soils
Extent: 5 to 15 percent of the unit

83C2—Kenyon loam, 5 to 9 percent slopes, moderately eroded

Component Description

Kenyon, moderately eroded, and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 11.2 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

Dinsdale, moderately eroded, and similar soils
Extent: 5 to 15 percent of the unit

Kenyon, severely eroded, and similar soils
Extent: 0 to 10 percent of the unit

88—Nevin silty clay loam, 0 to 2 percent slopes, rarely flooded

Component Description

Nevin, rarely flooded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Silty alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.3 inches
Content of organic matter in the upper 10 inches: 5.0 percent

Minor Dissimilar Components

Colo, occasionally flooded, and similar soils
Extent: 5 to 15 percent of the unit

110C—Lamont fine sandy loam, 2 to 9 percent slopes

Component Description

Lamont and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 2 to 9 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 8.8 inches
Content of organic matter in the upper 10 inches: 0.9 percent

Minor Dissimilar Components

Tell and similar soils
Extent: 5 to 15 percent of the unit

Fayette and similar soils
Extent: 0 to 10 percent of the unit

110E—Lamont fine sandy loam, 9 to 18 percent slopes

Component Description

Lamont and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 18 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 8.8 inches
Content of organic matter in the upper 10 inches: 0.9 percent

Minor Dissimilar Components

Chelsea and similar soils
Extent: 0 to 10 percent of the unit

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

Component Description

Garwin and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Upland flats
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loess
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.3 inches
Content of organic matter in the upper 10 inches: 6.0 percent

Minor Dissimilar Components

Muscatine and similar soils
Extent: 0 to 10 percent of the unit

119—Muscatine silty clay loam, 0 to 2 percent slopes

Component Description

Muscatine and similar soils
Extent: 90 to 100 percent of the unit

Position on the landscape: Slight rises on upland flats
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.2 inches
Content of organic matter in the upper 10 inches: 5.0 percent

Minor Dissimilar Components

Garwin and similar soils
Extent: 0 to 10 percent of the unit

119B—Muscatine silty clay loam, 2 to 5 percent slopes

Component Description

Muscatine and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Rises on upland flats
Slope range: 2 to 5 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.2 inches
Content of organic matter in the upper 10 inches: 5.0 percent

Minor Dissimilar Components

Tama and similar soils
Extent: 0 to 10 percent of the unit

120—Tama silty clay loam, 0 to 2 percent slopes

Component Description

Tama and similar soils
Extent: 100 percent of the unit
Position on the landscape: Summits and ridgetops
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess

Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 3.5 percent

120B—Tama silty clay loam, 2 to 5 percent slopes

Component Description

Tama and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Summits and ridgetops (fig. 8)
Slope range: 2 to 5 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Figure 8.—Contour buffer strips and grassed waterways help to control erosion in an area of Tama and Downs soils.

Minor Dissimilar Components

Osco and similar soils
Extent: 5 to 15 percent of the unit

120C—Tama silty clay loam, 5 to 9 percent slopes

Component Description

Tama and similar soils
Extent: 75 to 85 percent of the unit
Position on the landscape: Shoulders, summits, and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Osco and similar soils
Extent: 5 to 15 percent of the unit

Tama, moderately eroded, and similar soils
Extent: 5 to 15 percent of the unit

120C2—Tama silty clay loam, 5 to 9 percent slopes, moderately eroded

Component Description

Tama, moderately eroded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Shoulders, summits, and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 2.3 percent

Minor Dissimilar Components

Osco, moderately eroded, and similar soils
Extent: 5 to 15 percent of the unit

120D2—Tama silty clay loam, 9 to 14 percent slopes, moderately eroded

Component Description

Tama, moderately eroded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 2.3 percent

Minor Dissimilar Components

Ely and similar soils
Extent: 0 to 10 percent of the unit

Tama, severely eroded, and similar soils
Extent: 0 to 10 percent of the unit

121—Tama silt loam, 0 to 2 percent slopes

Component Description

Tama and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Summits and ridgetops
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Osco and similar soils
Extent: 5 to 15 percent of the unit

Muscatine and similar soils
Extent: 0 to 10 percent of the unit

122—Sperry silt loam, 0 to 1 percent slopes, depressional

Component Description

Sperry, depressional, and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Slight depressions on uplands
Slope range: 0 to 1 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Loess
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Months in which ponding does not occur: January, December
Deepest ponding: 0.5 foot (February, March, April, May, June, July, August, September, October, November)
Available water capacity to a depth of 60 inches: 11.0 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Muscatine and similar soils
Extent: 0 to 10 percent of the unit

133—Colo silty clay loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Colo, occasionally flooded, and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Flood plains (fig. 9)
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Silty alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.6 inches
Content of organic matter in the upper 10 inches: 5.5 percent

Minor Dissimilar Components

Colo, occasionally flooded, overwash, and similar soils
Extent: 0 to 10 percent of the unit

Ely and similar soils
Extent: 0 to 10 percent of the unit

Nodaway, occasionally flooded, and similar soils
Extent: 0 to 10 percent of the unit

133+—Colo silt loam, 0 to 2 percent slopes, occasionally flooded, overwash

Component Description

Colo, occasionally flooded, overwash, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Silty alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: At the surface (April)

Figure 9.—A grass buffer strip along Sugar Creek in an area of Colo soils helps to keep sediment out of the water.

Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 4.0 percent

Minor Dissimilar Components

Ackmore, occasionally flooded, and similar soils
Extent: 5 to 15 percent of the unit

136—Ankeny fine sandy loam, 0 to 2 percent slopes, rarely flooded

Component Description

Ankeny, rarely flooded, and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Alluvium or eolian sediments
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Ponding: None
Available water capacity to a depth of 60 inches: 9.4 inches
Content of organic matter in the upper 10 inches: 2.5 percent

Minor Dissimilar Components

Hanlon, rarely flooded, and similar soils
Extent: 5 to 15 percent of the unit

Hoopeston, rarely flooded, and similar soils
Extent: 0 to 10 percent of the unit

143—Brady sandy loam, 0 to 2 percent slopes

Component Description

Brady and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Outwash
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None

Available water capacity to a depth of 60 inches: 7.5 inches
Content of organic matter in the upper 10 inches: 1.9 percent

Minor Dissimilar Components

Spillville and similar soils
Extent: 0 to 10 percent of the unit

160—Walford silt loam, 0 to 2 percent slopes

Component Description

Walford and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Upland flats
Slope range: 0 to 1 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loess
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 2.3 percent

Minor Dissimilar Components

Atterberry and similar soils
Extent: 0 to 10 percent of the unit

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

Component Description

Downs and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Summits and ridgetops
Slope range: 2 to 5 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 2.6 percent

Minor Dissimilar Components

Greenbush and similar soils
Extent: 0 to 10 percent of the unit

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

Component Description

Downs and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Shoulders, summits, and ridgetops
Slope range: 5 to 9 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 2.6 percent

Minor Dissimilar Components

Greenbush and similar soils
Extent: 5 to 15 percent of the unit

Downs, moderately eroded, and similar soils
Extent: 0 to 10 percent of the unit

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

Component Description

Downs, moderately eroded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Shoulders, summits, and ridgetops
Slope range: 5 to 9 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.6 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

Greenbush, moderately eroded, and similar soils
Extent: 5 to 15 percent of the unit

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

Component Description

Downs, moderately eroded, and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.6 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

Greenbush, moderately eroded, and similar soils
Extent: 5 to 15 percent of the unit

Ely and similar soils
Extent: 0 to 10 percent of the unit

162D3—Downs silty clay loam, 9 to 14 percent slopes, severely eroded

Component Description

Downs, severely eroded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.6 inches
Content of organic matter in the upper 10 inches: 1.2 percent

Minor Dissimilar Components

Greenbush, severely eroded, and similar soils
Extent: 5 to 15 percent of the unit

162E3—Downs silty clay loam, 14 to 18 percent slopes, severely eroded

Component Description

Downs, severely eroded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Side slopes
Slope range: 14 to 18 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.6 inches
Content of organic matter in the upper 10 inches: 1.2 percent

Minor Dissimilar Components

Gara, severely eroded, and similar soils
Extent: 0 to 10 percent of the unit

Greenbush, moderately eroded, and similar soils
Extent: 0 to 10 percent of the unit

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

Component Description

Fayette and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Summits and ridgetops
Slope range: 2 to 5 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

Rozetta and similar soils
Extent: 0 to 10 percent of the unit

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

Component Description

Fayette and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Shoulders, summits, and ridgetops

Slope range: 5 to 9 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

Rozetta and similar soils
Extent: 5 to 15 percent of the unit

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

Component Description

Fayette, moderately eroded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Shoulders, summits, and ridgetops
Slope range: 5 to 9 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 1.2 percent

Minor Dissimilar Components

Rozetta, moderately eroded, and similar soils
Extent: 5 to 15 percent of the unit

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

Component Description

Fayette and similar soils
Extent: 75 to 85 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None

Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

Rozetta and similar soils
Extent: 5 to 15 percent of the unit

Ely and similar soils
Extent: 0 to 10 percent of the unit

Lindley and similar soils
Extent: 0 to 10 percent of the unit

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

Component Description

Fayette, moderately eroded, and similar soils
Extent: 75 to 85 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 1.2 percent

Minor Dissimilar Components

Rozetta, moderately eroded, and similar soils
Extent: 5 to 15 percent of the unit

Ely and similar soils
Extent: 0 to 10 percent of the unit

Lindley, moderately eroded, and similar soils
Extent: 0 to 10 percent of the unit

163D3—Fayette silty clay loam, 9 to 14 percent slopes, severely eroded

Component Description

Fayette, severely eroded, and similar soils
Extent: 65 to 85 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess

Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 1.1 percent

Minor Dissimilar Components

Lindley, severely eroded, and similar soils
Extent: 5 to 15 percent of the unit

Rozetta, severely eroded, and similar soils
Extent: 5 to 15 percent of the unit

Ely and similar soils
Extent: 0 to 10 percent of the unit

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

Component Description

Fayette and similar soils
Extent: 70 to 80 percent of the unit
Position on the landscape: Side slopes
Slope range: 14 to 18 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

Lindley and similar soils
Extent: 5 to 15 percent of the unit

Rozetta and similar soils
Extent: 5 to 15 percent of the unit

Ely and similar soils
Extent: 0 to 10 percent of the unit

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

Component Description

Fayette, moderately eroded, and similar soils
Extent: 65 to 75 percent of the unit
Position on the landscape: Side slopes
Slope range: 14 to 18 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained

Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 1.2 percent

Minor Dissimilar Components

Fayette, severely eroded, and similar soils
Extent: 5 to 15 percent of the unit

Rozetta, moderately eroded, and similar soils
Extent: 5 to 15 percent of the unit

Ely and similar soils
Extent: 0 to 10 percent of the unit

Lindley, moderately eroded, and similar soils
Extent: 0 to 10 percent of the unit

163E3—Fayette silty clay loam, 14 to 18 percent slopes, severely eroded

Component Description

Fayette, severely eroded, and similar soils
Extent: 75 to 85 percent of the unit
Position on the landscape: Side slopes
Slope range: 14 to 18 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 1.1 percent

Minor Dissimilar Components

Rozetta, severely eroded, and similar soils
Extent: 5 to 15 percent of the unit

Ely and similar soils
Extent: 0 to 10 percent of the unit

Lindley, severely eroded, and similar soils
Extent: 0 to 10 percent of the unit

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

Component Description

Fayette and similar soils
Extent: 70 to 80 percent of the unit
Position on the landscape: Side slopes

Slope range: 18 to 25 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

Lindley and similar soils
Extent: 5 to 15 percent of the unit

Rozetta and similar soils
Extent: 5 to 15 percent of the unit

Ely and similar soils
Extent: 0 to 10 percent of the unit

163F2—Fayette silt loam, 18 to 25 percent slopes, moderately eroded

Component Description

Fayette, moderately eroded, and similar soils
Extent: 65 to 75 percent of the unit
Position on the landscape: Side slopes
Slope range: 18 to 25 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 1.2 percent

Minor Dissimilar Components

Fayette, severely eroded, and similar soils
Extent: 5 to 15 percent of the unit

Lindley, moderately eroded, and similar soils
Extent: 5 to 15 percent of the unit

Rozetta, moderately eroded, and similar soils
Extent: 5 to 15 percent of the unit

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

Component Description

Fayette and similar soils
Extent: 80 to 90 percent of the unit

Position on the landscape: Side slopes
Slope range: 25 to 40 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

Lindley and similar soils
Extent: 5 to 15 percent of the unit

Rozetta and similar soils
Extent: 0 to 10 percent of the unit

171B—Bassett loam, 2 to 5 percent slopes

Component Description

Bassett and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 11.1 inches
Content of organic matter in the upper 10 inches: 2.5 percent

Minor Dissimilar Components

Waubeek and similar soils
Extent: 5 to 15 percent of the unit

Franklin and similar soils
Extent: 0 to 10 percent of the unit

171C2—Bassett loam, 5 to 9 percent slopes, moderately eroded

Component Description

Bassett, moderately eroded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Loam

Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 10.9 inches
Content of organic matter in the upper 10 inches: 1.8 percent

Minor Dissimilar Components

Franklin and similar soils
Extent: 0 to 10 percent of the unit

Waubeek, moderately eroded, and similar soils
Extent: 0 to 10 percent of the unit

171D2—Bassett loam, 9 to 14 percent slopes, moderately eroded

Component Description

Bassett, moderately eroded, and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 10.9 inches
Content of organic matter in the upper 10 inches: 1.8 percent

Minor Dissimilar Components

Waubeek, moderately eroded, and similar soils
Extent: 5 to 15 percent of the unit

Bassett, severely eroded, and similar soils
Extent: 0 to 10 percent of the unit

175B—Dickinson fine sandy loam, 2 to 5 percent slopes

Component Description

Dickinson and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Summits
Slope range: 2 to 5 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained

Parent material: Eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.7 inches
Content of organic matter in the upper 10 inches: 1.4 percent

Minor Dissimilar Components

Pillot and similar soils
Extent: 0 to 10 percent of the unit

175C—Dickinson fine sandy loam, 5 to 9 percent slopes

Component Description

Dickinson and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.7 inches
Content of organic matter in the upper 10 inches: 1.4 percent

Minor Dissimilar Components

Sparta and similar soils
Extent: 5 to 15 percent of the unit

Pillot and similar soils
Extent: 0 to 10 percent of the unit

177—Saude loam, 0 to 2 percent slopes

Component Description

Saude and similar soils
Extent: 80 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy alluvium over sandy and gravelly alluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 6.5 inches
Content of organic matter in the upper 10 inches: 3.4 percent

Minor Dissimilar Components

Lawler and similar soils
Extent: 0 to 10 percent of the unit

Richwood and similar soils
Extent: 0 to 10 percent of the unit

184—Klinger silty clay loam, 1 to 3 percent slopes

Component Description

Klinger and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Summits and slight rises on upland flats
Slope range: 1 to 3 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 4.8 percent

Minor Dissimilar Components

Maxfield and similar soils
Extent: 0 to 10 percent of the unit

212—Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Kennebec, occasionally flooded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Silty alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 13.4 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Colo, occasionally flooded, and similar soils
Extent: 5 to 15 percent of the unit

220—Nodaway silt loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Nodaway, occasionally flooded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Silty alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 13.2 inches
Content of organic matter in the upper 10 inches: 1.9 percent

Minor Dissimilar Components

Ackmore, occasionally flooded, and similar soils
Extent: 0 to 10 percent of the unit

Colo, occasionally flooded, and similar soils
Extent: 0 to 10 percent of the unit

221—Klossner muck, 1 to 3 percent slopes

Component Description

Klossner and similar soils
Extent: 100 percent of the unit
Position on the landscape: Footslopes
Slope range: 1 to 3 percent
Texture of the surface layer: Muck
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Organic material overlying loamy deposits
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 16.5 inches
Content of organic matter in the upper 10 inches: 35.0 percent

291—Atterberry silt loam, 0 to 2 percent slopes

Component Description

Atterberry and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Upland flats
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 2.5 percent

Minor Dissimilar Components

Walford and similar soils
Extent: 5 to 15 percent of the unit

291B—Atterberry silt loam, 2 to 5 percent slopes

Component Description

Atterberry and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Upland flats and ridgetops
Slope range: 2 to 5 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 2.5 percent

Minor Dissimilar Components

Greenbush and similar soils
Extent: 0 to 10 percent of the unit

293C—Fayette-Chelsea-Tell complex, 5 to 9 percent slopes

Component Description

Fayette and similar soils
Extent: 35 to 45 percent of the unit
Position on the landscape: Shoulders and summits

Slope range: 5 to 9 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Chelsea and similar soils
Extent: 25 to 35 percent of the unit
Position on the landscape: Shoulders and summits
Slope range: 5 to 9 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 4.4 inches
Content of organic matter in the upper 10 inches: 0.4 percent

Tell and similar soils
Extent: 15 to 25 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 5 to 9 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess over sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 8.1 inches
Content of organic matter in the upper 10 inches: 1.9 percent

Minor Dissimilar Components

Lamont and similar soils
Extent: 5 to 15 percent of the unit

293E—Fayette-Chelsea-Tell complex, 9 to 18 percent slopes

Component Description

Fayette and similar soils
Extent: 35 to 45 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 18 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained

Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Chelsea and similar soils
Extent: 25 to 35 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 18 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 4.4 inches
Content of organic matter in the upper 10 inches: 0.4 percent

Tell and similar soils
Extent: 15 to 25 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 18 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess over sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 8.1 inches
Content of organic matter in the upper 10 inches: 1.9 percent

Minor Dissimilar Components

Lamont and similar soils
Extent: 5 to 15 percent of the unit

293G—Fayette-Chelsea-Tell complex, 18 to 40 percent slopes

Component Description

Fayette and similar soils
Extent: 35 to 45 percent of the unit
Position on the landscape: Side slopes
Slope range: 18 to 40 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None

Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Chelsea and similar soils
Extent: 25 to 35 percent of the unit
Position on the landscape: Side slopes
Slope range: 18 to 40 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 4.4 inches
Content of organic matter in the upper 10 inches: 0.4 percent

Tell and similar soils
Extent: 15 to 25 percent of the unit
Position on the landscape: Side slopes
Slope range: 18 to 40 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess over sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 8.1 inches
Content of organic matter in the upper 10 inches: 1.9 percent

Minor Dissimilar Components

Lamont and similar soils
Extent: 5 to 15 percent of the unit

352B—Whittier silt loam, 2 to 5 percent slopes

Component Description

Whittier and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Shoulders, summits, and treads on stream terraces
Slope range: 2 to 5 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess over sandy eolian deposits
Flooding: None
Ponding: None
Available water capacity to a depth of 60 inches: 8.6 inches
Content of organic matter in the upper 10 inches: 3.0 percent

Minor Dissimilar Components

Atterberry and similar soils
Extent: 0 to 10 percent of the unit

352C2—Whittier silt loam, 5 to 9 percent slopes, moderately eroded

Component Description

Whittier, moderately eroded, and similar soils
Extent: 100 percent of the unit
Position on the landscape: Shoulders, treads, and risers on stream terraces
Slope range: 5 to 9 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess over sandy eolian deposits
Flooding: None
Ponding: None
Available water capacity to a depth of 60 inches: 8.1 inches
Content of organic matter in the upper 10 inches: 2.1 percent

354—Aquolls, ponded, 0 to 1 percent slopes

Component Description

Aquolls, ponded, and similar soils
Extent: 100 percent of the unit
Position on the landscape: Depressions
Slope range: 0 to 1 percent
Texture of the surface layer: Variable
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Alluvium
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Months in which ponding does not occur: January, December
Deepest ponding: 0.5 foot (February, March, April, May, June, July, August, September, October, November)

377B—Dinsdale silty clay loam, 2 to 5 percent slopes

Component Description

Dinsdale and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Summits and ridgetops
Slope range: 2 to 5 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None

Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 4.0 percent

Minor Dissimilar Components

Klinger and similar soils
Extent: 5 to 15 percent of the unit

Kenyon and similar soils
Extent: 0 to 10 percent of the unit

377C—Dinsdale silty clay loam, 5 to 9 percent slopes

Component Description

Dinsdale and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 4.0 percent

Minor Dissimilar Components

Dinsdale, moderately eroded, and similar soils
Extent: 5 to 15 percent of the unit

Kenyon and similar soils
Extent: 0 to 10 percent of the unit

377C2—Dinsdale silty clay loam, 5 to 9 percent slopes, moderately eroded

Component Description

Dinsdale, moderately eroded, and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 11.2 inches
Content of organic matter in the upper 10 inches: 2.2 percent

Minor Dissimilar Components

Kenyon, moderately eroded, and similar soils
Extent: 0 to 10 percent of the unit

382—Maxfield silty clay loam, 0 to 2 percent slopes

Component Description

Maxfield and similar soils
Extent: 100 percent of the unit
Position on the landscape: Upland flats
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.6 inches
Content of organic matter in the upper 10 inches: 6.6 percent

412E—Emeline loam, 9 to 18 percent slopes

Component Description

Emeline and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 18 percent
Texture of the surface layer: Loam
Depth to restrictive feature: 4 to 10 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Parent material: Loamy sediments overlying limestone bedrock
Flooding: None
Ponding: None
Available water capacity to a depth of 60 inches: 1.8 inches
Content of organic matter in the upper 10 inches: 2.8 percent

Minor Dissimilar Components

Rock outcrop
Extent: 0 to 10 percent of the unit

Rockton and similar soils
Extent: 0 to 10 percent of the unit

420B—Tama silty clay loam, terrace, 2 to 5 percent slopes

Component Description

Tama, terrace, and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Treads on stream terraces

Slope range: 2 to 5 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Osco, terrace, and similar soils
Extent: 0 to 10 percent of the unit

428B—Ely silty clay loam, 2 to 5 percent slopes

Component Description

Ely and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Footslopes and alluvial fans
Slope range: 2 to 5 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Silty colluvium
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.3 inches
Content of organic matter in the upper 10 inches: 5.0 percent

Minor Dissimilar Components

Colo and similar soils
Extent: 0 to 10 percent of the unit

430—Ackmore silt loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Ackmore, occasionally flooded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Silty alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)

Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 3.0 percent

Minor Dissimilar Components

Colo, occasionally flooded, overwash, and similar soils
Extent: 5 to 15 percent of the unit

442C—Dickinson-Tama complex, 5 to 9 percent slopes

Component Description

Dickinson and similar soils
Extent: 50 to 60 percent of the unit
Position on the landscape: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Eolian deposits
Flooding: None
Ponding: None
Available water capacity to a depth of 60 inches: 5.7 inches
Content of organic matter in the upper 10 inches: 1.4 percent

Tama and similar soils
Extent: 35 to 45 percent of the unit
Position on the landscape: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Pillot and similar soils
Extent: 0 to 10 percent of the unit

450B—Pillot silt loam, 2 to 5 percent slopes

Component Description

Pillot and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Summits and ridgetops
Slope range: 2 to 5 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained

Parent material: Loess or other silty material over loamy sand or sandy deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 9.2 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Minor Dissimilar Components

Tama and similar soils
Extent: 5 to 15 percent of the unit

450C—Pillot silt loam, 5 to 9 percent slopes

Component Description

Pillot and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess or other silty material over loamy sand or sandy deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 9.2 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Minor Dissimilar Components

Tama and similar soils
Extent: 5 to 15 percent of the unit

Ely and similar soils
Extent: 0 to 10 percent of the unit

462B—Downs silt loam, terrace, 2 to 5 percent slopes

Component Description

Downs, terrace, and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 2 to 5 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None

Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 2.6 percent

Minor Dissimilar Components

Greenbush, terrace, and similar soils
Extent: 0 to 10 percent of the unit

462C—Downs silt loam, terrace, 5 to 9 percent slopes

Component Description

Downs, terrace, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Risers on stream terraces
Slope range: 5 to 9 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 2.6 percent

Minor Dissimilar Components

Whittier, terrace, and similar soils
Extent: 5 to 15 percent of the unit

463B—Fayette silt loam, terrace, 2 to 5 percent slopes

Component Description

Fayette, terrace, and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 2 to 5 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

Thebes, terrace, and similar soils
Extent: 0 to 10 percent of the unit

467—Radford silt loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Radford, occasionally flooded, and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Silty alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.3 inches
Content of organic matter in the upper 10 inches: 3.0 percent

Minor Dissimilar Components

Colo, occasionally flooded, overwash, and similar soils
Extent: 0 to 10 percent of the unit

478G—Rock outcrop-Emeline complex, 18 to 60 percent slopes

Component Description

Rock outcrop
Extent: 55 to 65 percent of the unit
Position on the landscape: Side slopes
Slope range: 18 to 60 percent

Emeline and similar soils
Extent: 25 to 35 percent of the unit
Position on the landscape: Side slopes
Slope range: 18 to 60 percent
Texture of the surface layer: Loam
Depth to restrictive feature: 4 to 10 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Parent material: Loamy sediments overlying limestone bedrock
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 1.8 inches
Content of organic matter in the upper 10 inches: 2.8 percent

Minor Dissimilar Components

Lacrescent and similar soils
Extent: 0 to 10 percent of the unit

Rockton and similar soils
Extent: 0 to 10 percent of the unit

485—Spillville loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Spillville, occasionally flooded, and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 4.1 percent

Minor Dissimilar Components

Nodaway, occasionally flooded, and similar soils
Extent: 5 to 15 percent of the unit

Colo, occasionally flooded, and similar soils
Extent: 0 to 10 percent of the unit

520—Coppock silt loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Coppock, occasionally flooded, and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Silty alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None

Available water capacity to a depth of 60 inches: 11.4 inches
Content of organic matter in the upper 10 inches: 2.5 percent

Minor Dissimilar Components

Vesser, occasionally flooded, and similar soils
Extent: 0 to 10 percent of the unit

520B—Coppock silt loam, 2 to 5 percent slopes

Component Description

Coppock and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Footslopes and alluvial fans
Slope range: 2 to 5 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Silty alluvium
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.4 inches
Content of organic matter in the upper 10 inches: 2.5 percent

Minor Dissimilar Components

Vesser and similar soils
Extent: 0 to 10 percent of the unit

662C2—Mt. Carroll silt loam, 5 to 9 percent slopes, moderately eroded

Component Description

Mt. Carroll, moderately eroded, and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Ponding: None
Available water capacity to a depth of 60 inches: 12.8 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

Mt. Carroll, severely eroded, and similar soils
Extent: 0 to 10 percent of the unit

662D2—Mt. Carroll silt loam, 9 to 14 percent slopes, moderately eroded

Component Description

Mt. Carroll, moderately eroded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Ponding: None
Available water capacity to a depth of 60 inches: 12.8 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

Mt. Carroll, severely eroded, and similar soils
Extent: 5 to 15 percent of the unit

662D3—Mt. Carroll silt loam, 9 to 14 percent slopes, severely eroded

Component Description

Mt. Carroll, severely eroded, and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silt loam
Drainage class: Well drained
Parent material: Loess
Flooding: None
Ponding: None
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 1.3 percent

Minor Dissimilar Components

Seaton, moderately eroded, and similar soils
Extent: 0 to 10 percent of the unit

662E3—Mt. Carroll silt loam, 14 to 18 percent slopes, severely eroded

Component Description

Mt. Carroll, severely eroded, and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 14 to 18 percent
Texture of the surface layer: Silt loam

Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Ponding: None
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 1.3 percent

Minor Dissimilar Components

Seaton, severely eroded, and similar soils
Extent: 0 to 10 percent of the unit

729B—Ackmore-Nodaway complex, 2 to 5 percent slopes

Component Description

Ackmore and similar soils
Extent: 45 to 55 percent of the unit
Position on the landscape: Upland drainageways
Slope range: 2 to 5 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Silty alluvium
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 3.0 percent

Nodaway and similar soils
Extent: 35 to 45 percent of the unit
Position on the landscape: Upland drainageways
Slope range: 2 to 5 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Silty alluvium
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 13.2 inches
Content of organic matter in the upper 10 inches: 1.9 percent

Minor Dissimilar Components

Colo, frequently flooded, and similar soils
Extent: 0 to 10 percent of the unit

Ely and similar soils
Extent: 0 to 10 percent of the unit

760—Ansgar silt loam, 0 to 2 percent slopes

Component Description

Ansgar and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Upland flats and the upper head of drainageways
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Drainage class: Poorly drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.4 inches
Content of organic matter in the upper 10 inches: 2.9 percent

Minor Dissimilar Components

Franklin and similar soils
Extent: 0 to 10 percent of the unit

761—Franklin silt loam, 1 to 3 percent slopes

Component Description

Franklin and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Upland divides and coves at head of drainageways
Slope range: 1 to 3 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.4 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Minor Dissimilar Components

Ansgar and similar soils
Extent: 0 to 10 percent of the unit

Waubeek and similar soils
Extent: 0 to 10 percent of the unit

771B—Waubeek silt loam, 2 to 5 percent slopes

Component Description

Waubeek and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Ridgetops and shoulders

Slope range: 2 to 5 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 3.0 percent

Minor Dissimilar Components

Franklin and similar soils
Extent: 5 to 15 percent of the unit

Bassett and similar soils
Extent: 0 to 10 percent of the unit

814D—Rockton loam, 5 to 14 percent slopes

Component Description

Rockton and similar soils
Extent: 75 to 95 percent of the unit
Position on the landscape: Side slopes
Slope range: 5 to 14 percent
Texture of the surface layer: Loam
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Parent material: Loamy sediments over paleosol over limestone
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.7 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Emeline and similar soils
Extent: 5 to 15 percent of the unit

Dickinson and similar soils
Extent: 0 to 10 percent of the unit

826—Rowley silt loam, 0 to 2 percent slopes

Component Description

Rowley and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained

Parent material: Silty alluvium underlain by sandy alluvium
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 9.3 inches
Content of organic matter in the upper 10 inches: 4.5 percent

Minor Dissimilar Components

Lawler and similar soils
Extent: 0 to 10 percent of the unit

Ossian and similar soils
Extent: 0 to 10 percent of the unit

Saude and similar soils
Extent: 0 to 10 percent of the unit

884—Klingmore silty clay loam, 1 to 3 percent slopes

Component Description

Klingmore and similar soils
Extent: 85 to 95 percent of the unit
Position on the landscape: Summits and slight rises on upland flats
Slope range: 1 to 3 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 4.9 percent

Minor Dissimilar Components

Klinger and similar soils
Extent: 0 to 10 percent of the unit

Maxmore and similar soils
Extent: 0 to 10 percent of the unit

911B—Colo-Ely complex, 2 to 5 percent slopes

Component Description

Colo and similar soils
Extent: 50 to 60 percent of the unit
Position on the landscape: Upland drainageways (fig. 10)
Slope range: 2 to 5 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Silty alluvium

Figure 10.—Grassed waterways help to control erosion in an area of Colo-Ely complex, 2 to 5 percent slopes.

Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.6 inches
Content of organic matter in the upper 10 inches: 5.5 percent

Ely and similar soils
Extent: 30 to 40 percent of the unit
Position on the landscape: Footslopes along upland drainageways
Slope range: 2 to 5 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Silty colluvium
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.3 inches
Content of organic matter in the upper 10 inches: 5.0 percent

Minor Dissimilar Components

Colo, frequently flooded, and similar soils
Extent: 0 to 10 percent of the unit

Judson and similar soils
Extent: 0 to 10 percent of the unit

977—Richwood silt loam, 0 to 2 percent slopes

Component Description

Richwood and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess and/or silty deposits over stratified sandy alluvium
Flooding: None
Ponding: None
Available water capacity to a depth of 60 inches: 12.0 inches
Content of organic matter in the upper 10 inches: 3.9 percent

Minor Dissimilar Components

Rowley and similar soils
Extent: 0 to 10 percent of the unit

982—Maxmore silty clay loam, 0 to 2 percent slopes

Component Description

Maxmore and similar soils
Extent: 75 to 85 percent of the unit
Position on the landscape: Upland flats
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 6.6 percent

Minor Dissimilar Components

Colo, frequently flooded, and similar soils
Extent: 5 to 15 percent of the unit

Maxfield and similar soils
Extent: 5 to 15 percent of the unit

1118—Garwin silty clay loam, terrace, 0 to 2 percent slopes

Component Description

Garwin, terrace, and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Treads on stream terraces

Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loess
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.3 inches
Content of organic matter in the upper 10 inches: 6.0 percent

Minor Dissimilar Components

Muscatine, terrace, and similar soils
Extent: 0 to 10 percent of the unit

1119—Muscatine silty clay loam, terrace, 0 to 2 percent slopes

Component Description

Muscatine, terrace, and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.2 inches
Content of organic matter in the upper 10 inches: 5.0 percent

Minor Dissimilar Components

Garwin, terrace, and similar soils
Extent: 0 to 10 percent of the unit

1160—Walford silt loam, terrace, 0 to 2 percent slopes

Component Description

Walford, terrace, and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loess
Flooding: None
Shallowest depth to wet zone: At the surface (April)

Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 2.3 percent

Minor Dissimilar Components

Atterberry, terrace, and similar soils
Extent: 0 to 10 percent of the unit

1220—Nodaway silt loam, 0 to 2 percent slopes, channeled, frequently flooded

Component Description

Nodaway, channeled, frequently flooded, and similar soils
Extent: 80 to 90 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Silty alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Frequent (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 13.2 inches
Content of organic matter in the upper 10 inches: 1.9 percent

Minor Dissimilar Components

Colo, channeled, frequently flooded, and similar soils
Extent: 5 to 15 percent of the unit

Aquents, channeled, frequently flooded, ponded, and similar soils
Extent: 0 to 10 percent of the unit

1291—Atterberry silt loam, terrace, 0 to 2 percent slopes

Component Description

Atterberry, terrace, and similar soils
Extent: 90 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None

Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 2.5 percent

Minor Dissimilar Components

Walford, terrace, and similar soils
Extent: 0 to 10 percent of the unit

1315—Perks-Spillville complex, 0 to 2 percent slopes, channeled, frequently flooded

Component Description

Perks, frequently flooded, and similar soils
Extent: 40 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loamy sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Frequent (February, March, April, May, June, July, August, September, October, November)
Ponding: None
Available water capacity to a depth of 60 inches: 2.2 inches
Content of organic matter in the upper 10 inches: 0.9 percent

Spillville, frequently flooded, and similar soils
Extent: 30 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Frequent (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 4.1 percent

Minor Dissimilar Components

Aquents, frequently flooded, ponded, and similar soils
Extent: 15 percent of the unit

Colo, frequently flooded, and similar soils
Extent: 15 percent of the unit

4946—Udorthents-Highway complex, 0 to 5 percent slopes

Component Description

Udorthents and similar soils
Extent: 60 to 70 percent of the unit
Slope range: 0 to 5 percent
Texture of the surface layer: Variable
Parent material: Loamy deposits
Flooding: None
Ponding: None

Highway
Extent: 25 to 35 percent of the unit
Slope range: 0 to 5 percent
Flooding: None
Ponding: None

Minor Dissimilar Components

Aquents, ponded, and similar soils
Extent: 0 to 10 percent of the unit

5010—Pits, sand and gravel

- This map unit consists of areas from which sand and gravel have been removed.

5030—Pits, limestone quarries

- This map unit consists of areas from which limestone has been removed (fig. 11).

5040—Udorthents, loamy

Component Description

Udorthents, loamy, and similar soils
Extent: 100 percent of the unit
Texture of the surface layer: Variable
Parent material: Loamy deposits
Flooding: None
Ponding: None

5053—Psammaquents, 0 to 2 percent slopes, frequently flooded

Component Description

Psammaquents, frequently flooded, and similar soils
Extent: 100 percent of the unit
Position on the landscape: Flood plains (fig. 12)

Figure 11.—A limestone quarry south of Tipton.

Slope range: 0 to 2 percent
Texture of the surface layer: Variable
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Sandy deposits
Months in which flooding does not occur: January, December
Highest frequency of flooding: Frequent (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None

8041B—Sparta loamy fine sand, terrace, 1 to 5 percent slopes

Component Description

Sparta, terrace, and similar soils
Extent: 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 2 to 5 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy alluvium
Flooding: None

Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.2 inches
Content of organic matter in the upper 10 inches: 1.5 percent

8041C—Sparta loamy fine sand, terrace, 5 to 9 percent slopes

Component Description

Sparta, terrace, and similar soils
Extent: 100 percent of the unit
Position on the landscape: Treads and risers on stream terraces
Slope range: 5 to 9 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy alluvium
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.2 inches
Content of organic matter in the upper 10 inches: 1.5 percent

Figure 12.—An area of Psammaquents, commonly known as sandbars, along the banks of the Cedar River.

AW—Animal waste lagoon

- This map unit consists of shallow ponds constructed to hold animal waste from farm feedlots.

SL—Sewage lagoon

- This map unit consists of shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid waste.

W—Water

- This map unit consists of natural bodies of water.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999 and 2006). 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. Twelve 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; type of saturation; 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 subgroup 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 taxonomic class. 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, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, superactive, mesic Typic Endoaquolls.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

The table “Classification of the Soils” in Part II of this publication indicates the order, suborder, great group, subgroup, and family of the soil series in the survey area.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. 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” (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (Soil Survey Staff, 1999) and in “Keys to Soil Taxonomy” (Soil Survey Staff, 2006). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

Ackmore Series

Typical Pedon

Ackmore silt loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; Cedar County, Iowa; about 1,980 feet north and 2,300 feet east of the southwest corner of sec. 2, T. 81 N., R. 1 W.; USGS Lowden (IA) topographic quadrangle; lat. 41 degrees 51 minutes 17 seconds N. and long. 90 degrees 55 minutes 40.4 seconds W., NAD 83:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; few very fine roots; few fine low-continuity dendritic tubular pores; moderately acid; abrupt smooth boundary.

C—8 to 22 inches; about 60 percent dark grayish brown (10YR 4/2) and 40 percent very dark grayish brown (10YR 3/2) silt loam; massive; friable; few very fine roots; few fine low-continuity dendritic tubular pores; moderately acid; abrupt smooth boundary.

Ab1—22 to 31 inches; black (N 2/) silty clay loam; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; few fine low-continuity dendritic tubular pores; moderately acid; gradual smooth boundary.

Ab2—31 to 40 inches; black (N 2/) silty clay loam; weak fine prismatic structure parting to weak fine subangular blocky; friable; few very fine roots; few very fine low-continuity dendritic tubular pores; moderately acid; gradual smooth boundary.

Ab3—40 to 50 inches; about 70 percent black (10YR 2/1) and 30 percent very dark grayish brown (10YR 3/2) silty clay loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; few very fine roots; few very fine low-continuity dendritic tubular pores; common fine prominent dark reddish brown (5YR 3/4) irregular masses of oxidized iron on vertical faces of peds; moderately acid; gradual smooth boundary.

Bb1—50 to 63 inches; about 60 percent dark gray (10YR 4/1) and 40 percent very dark gray (10YR 3/1) silty clay loam; weak medium prismatic structure; friable; few very fine roots; few very fine low-continuity dendritic tubular pores; common fine faint black (10YR 2/1) spherical manganese masses; common fine prominent strong brown (7.5YR 4/6) irregular iron-manganese masses on surfaces along root channels; common fine prominent dark reddish brown (5YR 3/4) irregular masses of oxidized iron infused into the matrix along faces of peds; moderately acid; gradual smooth boundary.

Bb2—63 to 80 inches; dark gray (10YR 4/1) silty clay loam; weak medium prismatic structure; friable; few very fine roots; few very fine low-continuity dendritic tubular pores; common fine prominent strong brown (7.5YR 4/6) irregular masses of oxidized iron on surfaces along root channels; neutral.

Range in Characteristics

Depth to buried horizons: 20 to 40 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

C horizon:
Hue—10YR
Value—2 to 5
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

Ab horizon:
Hue—10YR or N
Value—2 to 4
Chroma—0 to 2
Texture—silty clay loam or silt loam
Reaction—moderately acid to slightly alkaline

Bb horizon (where present):
Hue—10YR
Value—3 or 4
Chroma—1 or 2
Texture—silty clay loam
Reaction—slightly acid to slightly alkaline

Ankeny Series

Typical Pedon

Ankeny fine sandy loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field; Cedar County, Iowa; about 1,330 feet west and 70 feet north of the southeast corner of sec. 17, T. 81 N., R. 4 W.; USGS Cedar Bluff (IA) topographic quadrangle; lat. 41 degrees 49 minutes 00.4 seconds N. and long. 91 degrees 19 minutes 55.4 seconds W., NAD 83:

Ap—0 to 9 inches; very dark gray (10YR 3/1) fine sandy loam, dark gray (10YR 4/1) dry; moderate fine granular structure; very friable; few very fine roots; few fine low-continuity dendritic tubular pores; slightly acid; abrupt smooth boundary.

A1—9 to 16 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; very friable; few very fine roots; few very fine low-continuity dendritic tubular pores; slightly acid; gradual smooth boundary.

A2—16 to 24 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; very friable; few very fine roots; few very fine low-continuity dendritic tubular pores; slightly acid; gradual smooth boundary.

A3—24 to 30 inches; very dark grayish brown (10YR 3/2) fine sandy loam, gray (10YR 6/1) dry; weak fine subangular blocky structure; very friable; few very fine roots; few very fine low-continuity dendritic tubular pores; slightly acid; gradual smooth boundary.

BA—30 to 37 inches; dark brown (10YR 3/3) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; very friable; few very fine roots in top part of horizon; few fine low-continuity dendritic tubular pores; slightly acid; clear smooth boundary.
Bw—37 to 44 inches; brown (10YR 4/3) fine sandy loam; weak medium and coarse subangular blocky structure; very friable; few very fine low-continuity dendritic tubular pores; neutral; abrupt wavy boundary.
2C1—44 to 65 inches; brown (10YR 5/3) loamy fine sand; single grain; loose; neutral; gradual smooth boundary.
2C2—65 to 80 inches; light olive brown (10YR 5/4) fine sand; single grain; loose; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 40 inches
Depth to carbonates: More than 60 inches
Other features: Some pedons have 2E and Bt horizons.

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam
Reaction—slightly acid or neutral

BA horizon (where present):
Hue—10YR
Value—3
Chroma—2 or 3
Texture—fine sandy loam
Reaction—slightly acid or neutral

Bw horizon:
Hue—10YR
Value—3 to 5
Chroma—3 or 4
Texture—fine sandy loam or sandy loam
Reaction—slightly acid or neutral

2C horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—loamy fine sand, fine sand, loamy sand, or sand
Reaction—slightly acid to slightly alkaline

Ansgar Series

Typical Pedon

Ansgar silt loam, 0 to 2 percent slopes, in a cultivated field; Cedar County, Iowa; about 558 feet east and 870 feet south of the northwest corner of sec. 33, T 81 N., R. 3 W.; USGS Tipton West (IA) topographic quadrangle; lat. 41 degrees 47 minutes 03.7 seconds N. and long. 91 degrees 12 minutes 30.1 seconds W., NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak medium and fine granular structure; friable; common fine roots between peds; few fine dendritic tubular pores; moderately acid; clear smooth boundary.

E—8 to 15 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium and thin platy structure; friable; few fine roots; few fine dendritic tubular pores; few distinct very dark gray (10YR 3/1) organic stains on surfaces along root channels; common medium distinct dark yellowish brown (10YR 4/4) irregular masses of oxidized iron; moderately acid; clear smooth boundary.

Btg1—15 to 23 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate fine subangular blocky structure parting to moderate fine granular; firm; few fine roots between peds; common fine dendritic tubular pores; few faint light olive brown (2.5Y 5/3) organoargillans on all faces of peds; common fine distinct yellowish brown (10YR 5/6) irregular masses of oxidized iron; moderately acid; clear smooth boundary.

Btg2—23 to 30 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate fine prismatic structure parting to moderate medium subangular blocky; firm; few fine roots between peds; common fine dendritic tubular pores; few very dark gray (10YR 3/1) organoargillans on vertical faces of peds; common fine distinct black (10YR 2/1) manganese masses; moderately acid; clear smooth boundary.

Btg3—30 to 38 inches; gray (5Y 5/1) silty clay loam; strong fine prismatic structure parting to strong medium subangular blocky; firm; few fine roots between peds; common fine dendritic tubular pores; few distinct very dark gray (10YR 3/1) organoargillans on vertical faces of peds; common fine distinct black (10YR 2/1) manganese masses; many medium and coarse prominent dark yellowish brown (10YR 4/6) irregular masses of oxidized iron; moderately acid; abrupt wavy boundary.

2Btg4—38 to 52 inches; grayish brown (2.5Y 5/2) sandy clay loam; weak medium prismatic structure; friable; few very dark gray (10YR 3/1) organoargillans on vertical faces of peds; many medium and coarse prominent yellowish brown (10YR 5/8) irregular masses of oxidized iron; moderately acid; abrupt wavy boundary.

2BC—52 to 58 inches; light brownish gray (2.5Y 6/2) loam; weak coarse prismatic structure; friable; many coarse prominent yellowish brown (10YR 5/6) irregular masses of oxidized iron; slightly acid; gradual smooth boundary.

2C1—58 to 70 inches; light brownish gray (2.5Y 6/2) loam; massive; friable; many very coarse prominent yellowish brown (10YR 5/8) irregular masses of oxidized iron; about 3 percent subrounded gravel; slightly acid; gradual smooth boundary.

2C2—70 to 80 inches; yellowish brown (10YR 5/6) sandy clay loam; massive; friable; many very coarse prominent light brownish gray (2.5Y 6/2) irregular masses of reduced iron; about 2 percent subrounded gravel; moderately acid.

Range in Characteristics

Depth to till: 20 to 40 inches

A or Ap horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1
- Texture—silt loam or silty clay loam
- Reaction—moderately acid to neutral

E horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 or 2
Texture—silt loam
Reaction—strongly acid to slightly acid

Btg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay loam
Reaction—strongly acid to neutral

2Btg, 2BC, and 2C horizons:
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—loam, sandy clay loam, or clay loam
Reaction—moderately acid to neutral

Atterberry Series

Typical Pedon

Atterberry silt loam, 0 to 2 percent slopes, in a cultivated field; Cedar County, Iowa; about 130 feet north and 2,000 feet west of the southeast corner of sec. 22, T. 80 N., R. 1 W.; USGS Bennett (IA) topographic quadrangle; lat. 41 degrees 42 minutes 49.6 seconds N. and long. 90 degrees 56 minutes 42.2 seconds W., NAD 83:

Ap—0 to 9 inches; very dark brown (10YR 2/2) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; common fine roots; common fine dendritic tubular pores; neutral; abrupt smooth boundary.

E—9 to 16 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; friable; common fine dendritic tubular pores; slightly acid; clear smooth boundary.

BE—16 to 20 inches; brown (10YR 5/3) silty clay loam; moderate fine subangular blocky structure; friable; common fine dendritic tubular pores; few medium distinct yellowish brown (10YR 5/6) irregular masses of oxidized iron; slightly acid; gradual smooth boundary.

Btg1—20 to 28 inches; grayish brown (10YR 5/2) silty clay loam; moderate fine and medium subangular blocky structure; friable; few distinct clay films on all faces of peds; few distinct light gray (10YR 7/2) (dry) silt coatings on vertical faces of peds; common medium prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 4/6) irregular masses of oxidized iron; moderately acid; gradual smooth boundary.

Btg2—28 to 36 inches; grayish brown (2.5Y 5/2) silty clay loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; few distinct clay films on all faces of peds; common fine black (7.5YR 2/1) cylindrical manganese masses at top of horizon; many medium prominent strong brown (7.5YR 5/6 and 5/8) irregular masses of oxidized iron; strongly acid; gradual smooth boundary.

Btg3—36 to 48 inches; light brownish gray (2.5Y 6/2) silty clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; common distinct clay films on all faces of peds; few fine black (7.5YR 2/1)

cylindrical manganese masses; common medium prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) irregular masses of oxidized iron; strongly acid; gradual smooth boundary.

BCg—48 to 65 inches; light brownish gray (2.5Y 6/2) silt loam; weak coarse prismatic structure; friable; many medium and coarse prominent yellowish brown (10YR 5/6) irregular masses of oxidized iron; moderately acid; gradual smooth boundary.

Cg—65 to 80 inches; light brownish gray (2.5Y 6/2) silt loam; massive; friable; many coarse prominent strong brown (7.5YR 5/6) irregular masses of oxidized iron; moderately acid.

Range in Characteristics

Depth to carbonates: More than 60 inches

A or Ap horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 or 2
- Texture—silt loam
- Reaction—moderately acid to neutral

E horizon:
- Hue—10YR
- Value—4 to 6
- Chroma—1 or 2
- Texture—silt loam
- Reaction—strongly acid to neutral

Bt or Btg horizon:
- Hue—10YR, 2.5Y, or 5Y
- Value—4 to 6
- Chroma—2 to 4
- Texture—silty clay loam
- Reaction—strongly acid to neutral

C or Cg horizon:
- Hue—10YR, 2.5Y, or 5Y
- Value—4 to 6
- Chroma—1 to 4
- Texture—silt loam
- Reaction—moderately acid to slightly alkaline

Bassett Series

Typical Pedon

Bassett loam, 2 to 5 percent slopes, in a cultivated field; Cedar County, Iowa; about 443 feet north and 1,952 feet west of the southeast corner of sec. 9, T. 82 N., R. 1 W.; USGS Oxford Junction (IA) topographic quadrangle; lat. 41 degrees 55 minutes 07.5 seconds N. and long. 90 degrees 57 minutes 44.7 seconds W., NAD 83:

Ap—0 to 8 inches; very dark brown (10YR 2/2) loam, brown (10YR 4/3) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots; common fine dendritic tubular pores; slightly acid; abrupt smooth boundary.

E—8 to 10 inches; dark grayish brown (10YR 4/2) silt loam, brown (10YR 5/3) dry; friable; few fine roots; few fine dendritic tubular pores; few distinct dark gray

(10YR 3/1) organic stains on all faces of peds; strongly acid; clear smooth boundary.

BE—10 to 17 inches; about 70 percent dark yellowish brown (10YR 4/4) and 30 percent brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; few distinct very dark gray (10YR 3/1) organic stains on all faces of peds; very strongly acid; clear smooth boundary.

2Bt1—17 to 27 inches; dark yellowish brown (10YR 4/4) loam; weak fine subangular blocky structure; firm; few fine roots; few fine dendritic tubular pores; few distinct brown (10YR 4/3) clay films on all faces of peds; very strongly acid; clear smooth boundary.

2Bt2—27 to 37 inches; yellowish brown (10YR 5/4) loam; moderate fine subangular blocky structure; firm; few fine roots; few fine dendritic tubular pores; few distinct brown (10YR 5/3) clay films on all faces of peds; strongly acid; clear smooth boundary.

2Bt3—37 to 42 inches; yellowish brown (10YR 5/6) loam; moderate medium and fine subangular blocky structure; firm; few fine roots; few fine dendritic tubular pores; many very coarse prominent dark brown (7.5YR 3/3) irregular iron-manganese masses; common fine distinct brown (7.5YR 4/4) irregular masses of oxidized iron; strongly acid; abrupt smooth boundary.

2Bt4—42 to 49 inches; dark yellowish brown (10YR 4/6) sandy clay loam; strong medium subangular blocky structure; firm; few fine roots; few fine dendritic tubular pores; slightly acid; clear smooth boundary.

2BC1—49 to 59 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; firm; few prominent white (10YR 8/1) carbonate coatings on all faces of peds; common fine faint strong brown (7.5YR 4/6) irregular masses of oxidized iron; common coarse prominent light brownish gray (2.5Y 6/2) irregular masses of reduced iron; slightly effervescent; slightly alkaline; gradual smooth boundary.

2BC2—59 to 80 inches; about 50 percent gray (2.5Y 6/1) and 50 percent yellowish brown (10YR 5/6) loam; moderate coarse and medium prismatic structure; firm; few prominent white (10YR 8/1) carbonate coatings on all faces of peds; common fine prominent very dark gray (7.5YR 3/1) irregular iron-manganese masses; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to till: 12 to 26 inches
Depth to carbonates: 48 to 80 inches

A or Ap horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—2 or 3
- Texture—loam or silt loam
- Reaction—strongly acid to neutral

E horizon:
- Hue—10YR
- Value—3 or 4
- Chroma—2 or 3
- Texture—loam or silt loam
- Reaction—very strongly acid to neutral

BE horizon:
- Hue—7.5YR
- Value—4 to 8

Chroma—3 to 8
Texture—loam or silt loam
Reaction—very strongly acid to slightly acid

2Bt horizon:
Hue—7.5YR to 5Y
Value—4 to 8
Chroma—1 to 8
Texture—loam, clay loam, or sandy clay loam
Reaction—very strongly acid to slightly acid

2BC horizon:
Hue—7.5YR to 5Y
Value—4 to 8
Chroma—1 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline

Taxadjunct features: The representative pedon for the severely eroded Bassett soil in map unit 171D2 is a taxadjunct because the surface layer does not meet the requirements for the Mollic subgroup. This pedon is classified as a fine-loamy, mixed, superactive, mesic Typic Hapludalf.

Brady Series

Typical Pedon

Brady sandy loam, 0 to 2 percent slopes, in a cultivated field; Cedar County, Iowa; about 660 feet west and 100 feet north of the southeast corner of sec. 24, T. 79 N., R. 3 W.; USGS Rochester (IA) topographic quadrangle; lat. 41 degrees 37 minutes 37 seconds N. and long. 91 degrees 08 minutes 08 seconds W., NAD 83:

Ap—0 to 9 inches; very dark gray (10YR 3/1) sandy loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; few fine roots between peds; common fine low-continuity dendritic tubular pores; slightly acid; abrupt smooth boundary.

E—9 to 15 inches; grayish brown (10YR 5/2) sandy loam, light brownish gray (10YR 6/2) dry; weak coarse granular and weak medium subangular blocky structure; friable; few fine roots between peds; common fine low-continuity dendritic tubular pores; very few distinct dark grayish brown (10YR 4/2) organic stains on all faces of peds; few fine distinct black (N 2/) spherical manganese masses; slightly acid; clear wavy boundary.

BE—15 to 19 inches; brown (10YR 5/3) sandy loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; friable; few fine roots between peds; common fine low-continuity dendritic tubular pores; common distinct dark grayish brown (10YR 4/2) organic stains on all faces of peds; few fine distinct black (N 2/) spherical manganese masses; moderately acid; clear smooth boundary.

Bt1—19 to 31 inches; brown (10YR 5/3) sandy loam; moderate fine and medium subangular blocky structure; friable; few fine roots between peds; common fine low-continuity dendritic tubular pores; very few distinct grayish brown (10YR 5/2) clay films on all faces of peds; common medium faint pale brown (10YR 6/3) silt coatings on faces of peds; few fine prominent black (N 2/) spherical manganese masses; common fine prominent strong brown (7.5YR 5/6) iron-manganese masses on faces of peds; moderately acid; gradual smooth boundary.

Bt2—31 to 35 inches; pale brown (10YR 6/3) sandy loam; moderate fine and medium subangular blocky structure; friable; few very fine roots between peds; common very fine low-continuity dendritic tubular pores; few prominent grayish brown (10YR 5/2) clay films on all faces of peds; few distinct light gray (10YR 7/1) sand coatings on all faces of peds; few fine prominent strong brown (7.5YR 5/8) iron-manganese masses on faces of peds; few fine prominent black (N 2/) spherical manganese masses; moderately acid; clear smooth boundary.

Bt3—35 to 48 inches; brown (10YR 4/3) sandy loam; moderate medium angular blocky and subangular blocky structure; friable; few very fine roots between peds; common very fine low-continuity dendritic tubular pores; very few distinct clay films on all faces of peds; few distinct light gray (10YR 7/1) sand coatings on all faces of peds; common fine prominent black (N 2/) spherical manganese masses; many medium prominent strong brown (7.5YR 5/6) and many medium faint brown (7.5YR 4/4) iron-manganese masses on faces of peds; moderately acid; gradual smooth boundary.

BC—48 to 60 inches; about 50 percent brown (7.5YR 4/4) and 50 percent dark grayish brown (10YR 4/2) sandy loam; moderate medium and coarse subangular blocky structure; friable; very few distinct light gray (10YR 7/1) sand coatings on surfaces along root channels; few medium prominent light brownish gray (2.5Y 6/2) iron depletions; few fine prominent black (N 2/) spherical manganese masses; neutral; abrupt wavy boundary.

2C—60 to 80 inches; light brownish gray (10YR 6/2) loam; massive; friable; many medium distinct brown (7.5YR 4/4) iron depletions; neutral.

Range in Characteristics

Depth to carbonates: 40 to 70 inches

Ap or A horizon:
- Hue—7.5YR or 10YR
- Value—2, 2.5, or 3
- Chroma—1 to 3
- Texture—sandy loam, fine sandy loam, loamy fine sand, or loamy sand; less commonly loam or silt loam
- Reaction—strongly acid to neutral

E or BE horizon:
- Hue—10YR
- Value—5 or 6
- Chroma—2 to 4
- Texture—sandy loam, fine sandy loam, loamy fine sand, or loamy sand; less commonly loam or silt loam
- Reaction—strongly acid to neutral

Bt horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6
- Chroma—3 to 6
- Texture—sandy loam or gravelly sandy loam; less commonly sandy clay loam, gravelly sandy clay loam, or clay loam
- Reaction—strongly acid to neutral

BC horizon:
- Hue—7.5YR or 10YR
- Value—4 to 7
- Chroma—2 to 6

Texture—sandy loam or loamy sand
Reaction—strongly acid to neutral

2C horizon:
Hue—10YR
Value—4 to 6
Chroma—1 to 4
Texture—gravelly coarse sand, coarse sand, sand, gravelly sand, very gravelly sand, or stratified coarse sand and gravel
Reaction—neutral to moderately alkaline

Chelsea Series

Typical Pedon

Chelsea loamy fine sand, 5 to 9 percent slopes, in a wooded area; Cedar County, Iowa; about 2,198 feet south and 66 feet west of the northeast corner of sec. 19, T. 79 N., R. 2 W.; USGS Lime City (IA) topographic quadrangle; lat. 41 degrees 38 minutes 06.1 seconds N. and long. 91 degrees 06 minutes 46.1 seconds W., NAD 83:

A1—0 to 2 inches; very dark gray (10YR 3/1) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.
A2—2 to 6 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; few fine roots; moderately acid; clear smooth boundary.
E1—6 to 12 inches; dark grayish brown (10YR 4/2) fine sand, light grayish brown (10YR 6/2) dry; single grain; loose; strongly acid; gradual smooth boundary.
E2—12 to 24 inches; brown (10YR 4/3) fine sand, pale brown (10YR 6/3) dry; single grain; loose; strongly acid; gradual smooth boundary.
E3—24 to 42 inches; yellowish brown (10YR 5/4) fine sand, pale brown (10YR 6/3) dry; single grain; loose; strongly acid; gradual smooth boundary.
E and Bt—42 to 80 inches; about 80 percent light yellowish brown (10YR 6/4) fine sand (E); single grain; loose; lamellae of dark yellowish brown (10YR 4/4) sandy loam 1/2 inch to 2 inches thick at depths of 55, 61, 65, 67, 71, and 78 inches (Bt); strongly acid.

Range in Characteristics

Depth to uppermost lamellae: 27 to 46 inches

Ap or A horizon:
Hue—10YR
Value—3 or 4
Chroma—1 to 4
Texture—loamy fine sand or fine sand
Reaction—strongly acid to neutral

E horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—2 to 6
Texture—fine sand or loamy fine sand
Reaction—strongly acid to slightly acid

E and Bt horizon (E part):
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 6
Texture—fine sand or loamy fine sand
Reaction—strongly acid to slightly acid

E and Bt horizon (Bt part):
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—sandy loam, loamy sand, fine sandy loam, loamy fine sand, or fine sand
Reaction—strongly acid to slightly acid

Colo Series

Typical Pedon

Colo silty clay loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; Cedar County, Iowa; about 260 feet east and 1,435 feet south of the northwest corner of sec. 14, T. 79 N., R. 4 W.; USGS West Branch (IA) topographic quadrangle; lat. 41 degrees 39 minutes 08.9 seconds N. and long. 91 degrees 17 minutes 14.5 seconds W., NAD 83:

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few fine dendritic tubular pores; moderately acid; abrupt smooth boundary.
A1—9 to 19 inches; black (N 2/) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; few fine dendritic tubular pores; moderately acid; gradual smooth boundary.
A2—19 to 28 inches; black (N 2/) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure parting to weak fine subangular blocky; friable; few fine dendritic tubular pores; slightly acid; gradual smooth boundary.
A3—28 to 39 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; strong medium subangular blocky structure; friable; few fine dendritic tubular pores; slightly acid; gradual smooth boundary.
BA—39 to 49 inches; black (2.5Y 2.5/1) silty clay loam, dark gray (2.5Y 4/1) dry; strong medium subangular blocky structure; friable; slightly acid; gradual smooth boundary.
Bg—49 to 69 inches; very dark gray (2.5Y 3/2) silty clay loam, gray (2.5Y 5/1) dry; weak medium subangular blocky structure; friable; few fine prominent dark yellowish brown (10YR 3/6) irregular masses of oxidized iron; slightly acid; gradual smooth boundary.
BCg—69 to 80 inches; dark gray (2.5Y 4/1) and very dark gray (5Y 3/1) silty clay loam; weak medium prismatic structure; friable; few fine prominent dark yellowish brown (10YR 3/6) irregular masses of oxidized iron; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: More than 36 inches
Depth to carbonates: More than 60 inches

Ap or A horizon:
Hue—10YR to 5Y or N
Value—2 or 3

Chroma—0 to 2
Texture—silty clay loam or silt loam
Reaction—moderately acid to neutral

BA horizon:
Hue—10YR to 2.5Y or N
Value—2 or 3
Chroma—0 to 2
Texture—silty clay loam
Reaction—moderately acid to neutral

Bg horizon:
Hue—10YR to 2.5Y
Value—2 to 4
Chroma—1
Texture—silty clay loam
Reaction—moderately acid to neutral

BCg horizon:
Hue—10YR to 5Y
Value—3 to 6
Chroma—1 or 2
Texture—silty clay loam
Reaction—moderately acid to neutral

Cg horizon (where present):
Hue—10YR to 5Y
Value—3 to 6
Chroma—1 or 2
Texture—silty clay loam, silt loam, or clay loam
Reaction—moderately acid to neutral

Coppock Series

Typical Pedon

Coppock silt loam, 2 to 5 percent slopes, in a cultivated field; Cedar County, Iowa; about 1,300 feet south and 390 feet east of the northwest corner of sec. 36, T. 79 N., R. 4 W.; USGS West Liberty (IA) topographic quadrangle; lat. 41 degrees 36 minutes 32 seconds N. and long. 91 degrees 16 minutes 02.8 seconds W., NAD 83:

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; few fine roots; few very fine low-continuity dendritic tubular pores; neutral; abrupt smooth boundary.

E1—8 to 12 inches; dark gray (10YR 4/1) silt loam, gray (10YR 6/1) dry; weak medium platy structure parting to moderate medium granular; friable; few fine roots; few very fine low-continuity dendritic tubular pores; few distinct very dark gray (10YR 3/1) organic stains on all faces of peds; neutral; clear smooth boundary.

E2—12 to 18 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium platy structure; friable; few fine roots; few very fine low-continuity dendritic tubular pores; common distinct very dark gray (10YR 3/1) organic stains on all faces of peds; slightly acid; gradual smooth boundary.

E3—18 to 23 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium platy structure parting to weak very fine

subangular blocky; friable; few fine roots; few very fine low-continuity dendritic tubular pores; few distinct very dark grayish brown (10YR 3/2) organic stains on all faces of peds; few fine prominent yellowish brown (10YR 5/6) irregular masses of oxidized iron on faces of peds; few fine distinct light brownish gray (2.5Y 6/2) irregular iron depletions between peds; moderately acid; abrupt wavy boundary.

Btg1—23 to 29 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate fine and medium subangular blocky structure; friable; few fine roots; few very fine low-continuity dendritic tubular pores; common distinct dark grayish brown (10YR 4/2) clay films on all faces of peds; few fine faint light brownish gray (2.5Y 6/2) irregular iron depletions between peds; few fine prominent yellowish brown (10YR 5/6) spherical masses of oxidized iron on faces of peds; strongly acid; gradual smooth boundary.

Btg2—29 to 36 inches; dark grayish brown (10YR 4/2) silty clay loam; weak medium prismatic structure parting to weak medium angular blocky; friable; few very fine roots; common distinct dark grayish brown (10YR 4/2) clay films on all faces of peds; few medium prominent strong brown (7.5YR 5/6) irregular masses of oxidized iron on faces of peds; strongly acid; gradual smooth boundary.

Btg3—36 to 43 inches; grayish brown (10YR 5/2) silty clay loam; moderate medium prismatic structure parting to moderate medium angular blocky; friable; few very fine roots in top part of horizon; common distinct dark grayish brown (10YR 4/2) clay films on all faces of peds; few fine prominent black (10YR 2/1) spherical manganese masses; few medium prominent strong brown (7.5YR 5/6) irregular masses of oxidized iron on faces of peds; strongly acid; gradual smooth boundary.

Btg4—43 to 47 inches; light brownish gray (10YR 6/2) silty clay loam; moderate coarse prismatic structure parting to moderate medium angular blocky; friable; few distinct dark grayish brown (10YR 4/2) clay films on all faces of peds; common fine prominent black (10YR 2/1) spherical manganese masses; many medium prominent strong brown (7.5YR 5/6) irregular masses of oxidized iron on faces of peds; strongly acid; clear wavy boundary.

BCg—47 to 58 inches; gray (2.5Y 5/1) silt loam; massive; friable; few fine prominent black (10YR 2/1) spherical manganese masses; many medium prominent strong brown (7.5YR 5/6) masses of oxidized iron; strongly acid; gradual smooth boundary.

Cg—58 to 80 inches; light brownish gray (2.5Y 6/2) silt loam; massive; friable; few fine prominent black (10YR 2/1) spherical manganese masses; many coarse prominent strong brown (7.5YR 5/6) masses of oxidized iron; strongly acid.

Range in Characteristics

Depth to carbonates: More than 60 inches

Ap or A horizon:
- Hue—10YR
- Value—3
- Chroma—1 or 2
- Texture—silt loam
- Reaction—slightly acid or neutral

E horizon:
- Hue—10YR
- Value—4 to 6
- Chroma—1 or 2
- Texture—silt loam
- Reaction—moderately acid to neutral

Btg horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam
Reaction—very strongly acid to moderately acid

BCg or Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—strongly acid or moderately acid

Dickinson Series

Typical Pedon

Dickinson fine sandy loam, 2 to 5 percent slopes, in a cultivated field; Cedar County, Iowa; about 830 feet south and 2,395 feet east of the northwest corner of sec. 22, T. 81 N., R. 4 W.; USGS Cedar Bluff (IA) topographic quadrangle; lat. 41 degrees 48 minutes 50.5 seconds N. and long. 91 degrees 17 minutes 55.2 seconds W., NAD 83:

Ap—0 to 6 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; few fine roots; few fine dendritic tubular pores; neutral; abrupt smooth boundary.
A1—6 to 10 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; slightly acid; clear smooth boundary.
A2—10 to 18 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; few distinct very dark grayish brown (10YR 3/2) organic stains on all faces of peds; moderately acid; clear smooth boundary.
Bw1—18 to 27 inches; brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; few distinct very dark grayish brown (10YR 3/2) organic stains on all faces of peds; moderately acid; clear smooth boundary.
Bw2—27 to 33 inches; brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; very friable; few fine roots; few fine dendritic tubular pores; moderately acid; clear smooth boundary.
BC—33 to 40 inches; yellowish brown (10YR 5/4) loamy fine sand; weak fine subangular blocky structure; very friable; moderately acid; clear smooth boundary.
C1—40 to 63 inches; about 80 percent yellowish brown (10YR 5/4) and 20 percent dark yellowish brown (10YR 4/4) loamy fine sand; single grain; loose; moderately acid; gradual smooth boundary.
C2—63 to 80 inches; about 60 percent dark yellowish brown (10YR 4/6) and 40 percent yellowish brown (10YR 5/4) sand; single grain; loose; moderately acid.

Range in Characteristics

Thickness of the mollic epipedon: 12 to 24 inches
Depth to loamy sand and sand: 20 to 42 inches
Depth to carbonates: More than 60 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—fine sandy loam, sandy loam, or loam
Reaction—moderately acid to neutral

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—sandy loam or fine sandy loam
Reaction—strongly acid to slightly acid

BC and C horizons:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—3 to 6
Texture—loamy fine sand, loamy sand, fine sand, or sand
Reaction—moderately acid to neutral

Dinsdale Series

Typical Pedon

Dinsdale silty clay loam, 2 to 5 percent slopes, in a cultivated field; Cedar County, Iowa; about 2,000 feet west and 210 feet south of the northeast corner of sec. 7, T. 82 N., R. 2 W.; USGS Clarence (IA) topographic quadrangle; lat. 41 degrees 55 minutes 53.8 seconds N. and long. 91 degrees 07 minutes 14.1 seconds W., NAD 83:

Ap—0 to 8 inches; very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; few very fine roots; common very fine dendritic tubular pores; slightly acid; clear smooth boundary.

A—8 to 15 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 4/3) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; common very fine dendritic tubular pores; slightly acid; clear smooth boundary.

BA—15 to 20 inches; about 60 percent brown (10YR 4/3) and 40 percent dark brown (10YR 3/3) silty clay loam; weak fine subangular blocky structure; friable; few very fine roots between peds; few very fine dendritic tubular pores; moderately acid; gradual smooth boundary.

Bt1—20 to 29 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak fine subangular blocky structure; friable; few distinct clay films on all faces of peds; moderately acid; abrupt smooth boundary.

2Bt2—29 to 36 inches; yellowish brown (10YR 5/6) loam; weak medium prismatic structure parting to weak fine subangular blocky; friable; light gray (10YR 7/2) sand coatings on all faces of peds; few distinct clay films on all faces of peds; moderately acid; gradual smooth boundary.

2BC1—36 to 60 inches; yellowish brown (10YR 5/8) loam; weak medium prismatic structure; friable; common fine faint strong brown (7.5YR 4/6) and common fine prominent dark reddish brown (5YR 3/2) irregular masses of oxidized iron; moderately acid; gradual smooth boundary.

2BC2—60 to 80 inches; yellowish brown (10YR 5/8) loam; extremely coarse prismatic structure; firm; few medium prominent light brownish gray (2.5Y 6/2)

iron depletions; few fine distinct strong brown (7.5YR 4/6) masses of oxidized iron; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to till: 20 to 40 inches
Depth to carbonates: 45 to 65 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam or silty clay loam
Reaction—strongly acid to neutral

Bt horizon:
Hue—10YR
Value—3 to 5
Chroma—3 to 6
Texture—silty clay loam
Reaction—strongly acid to neutral

2Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 8
Texture—loam, sandy clay loam, or clay loam
Reaction—moderately acid to neutral

2BC horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 8
Texture—loam, sandy clay loam, or clay loam
Reaction—slightly acid to moderately alkaline

Taxadjunct features: The representative pedons for the moderately eroded Dinsdale soils in map units 83C2, 377C, and 377C2 are taxadjuncts because the surface layer does not meet the thickness requirements for a Mollisol. These pedons are classified as fine-silty, mixed, superactive, mesic Mollic Hapludalfs.

Downs Series

Typical Pedon

Downs silt loam, 5 to 9 percent slopes, in a wooded area; Cedar County, Iowa; about 175 feet east and 340 feet north of the southwest corner of sec. 3, T. 81 N., R. 3 W.; USGS Tipton West (IA) topographic quadrangle; lat. 41 degrees 50 minutes 45 seconds N. and long. 91 degrees 11 minutes 26.7 seconds W., NAD 83:

A—0 to 7 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; few fine roots; few fine dendritic tubular pores; slightly acid; clear smooth boundary.
E—7 to 12 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; few fine roots; few fine dendritic tubular pores; common distinct very dark

grayish brown (10YR 3/2) organic stains on faces of peds; moderately acid; clear smooth boundary.

BE—12 to 18 inches; brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; few distinct very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) organoargillans on faces of peds; moderately acid; clear smooth boundary.

Bt1—18 to 29 inches; dark yellowish brown (10YR 4/4) and brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; few distinct brown (10YR 4/3) organoargillans on faces of peds; strongly acid; clear smooth boundary.

Bt2—29 to 34 inches; brown (10YR 4/3) silty clay loam; moderate fine and medium angular blocky structure; friable; few medium and coarse roots; few fine dendritic tubular pores; few pale brown (10YR 6/3) (dry) silt coatings on faces of peds; strongly acid; clear smooth boundary.

Bt3—34 to 43 inches; brown (10YR 5/3 and 4/3) silty clay loam; strong fine and medium angular blocky structure; friable; few medium and coarse roots; few fine dendritic tubular pores; common distinct light gray (10YR 7/2) (dry) silt coatings on faces of peds; strongly acid; clear smooth boundary.

BC—43 to 59 inches; brown (10YR 4/3) silt loam; weak medium prismatic structure; firm; few medium and coarse roots; common distinct dark grayish brown (10YR 4/2) organoargillans on faces of peds; common distinct light brownish gray (10YR 6/2) (dry) silt coatings on faces of peds; common fine distinct black (10YR 2/1) (moist) irregular sharp manganese masses; moderately acid; gradual smooth boundary.

C—59 to 80 inches; about 90 percent dark yellowish brown (10YR 4/4) and 10 percent grayish brown (10YR 5/2) silt loam; massive; friable; common medium prominent black (10YR 2/1) irregular manganese masses; common medium distinct strong brown (7.5YR 4/6) irregular masses of oxidized iron; moderately acid.

Range in Characteristics

Depth to carbonates: More than 60 inches

Ap or A horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 or 2
- Texture—silt loam
- Reaction—moderately acid to neutral

E horizon:
- Hue—10YR
- Value—3 to 5
- Chroma—2 or 3
- Texture—silt loam
- Reaction—strongly acid to neutral

BE horizon:
- Hue—10YR
- Value—4
- Chroma—3 or 4
- Texture—silt loam
- Reaction—very strongly acid to slightly acid

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—silty clay loam or silt loam
Reaction—very strongly acid to slightly acid

BC and C horizons:
Hue—10YR
Value—5 or 6
Chroma—3 to 6
Texture—silt loam or silty clay loam
Reaction—strongly acid to slightly acid

Taxadjunct features: The representative pedons for the severely eroded Downs soils in map units 162D3 and 162E3 are taxadjuncts because the surface layer does not meet the requirements for the Mollic subgroup. These pedons are classified as fine-silty, mixed, superactive, mesic Typic Hapludalfs.

Ely Series

Typical Pedon

Ely silty clay loam, 2 to 5 percent slopes, in a cultivated field; Cedar County, Iowa; about 246 feet north and 2,135 feet east of the southwest corner of sec. 19, T. 79 N., R. 3 W.; USGS Rochester (IA) topographic quadrangle; lat. 41 degrees 37 minutes 39.8 seconds N. and long. 91 degrees 14 minutes 30.7 seconds W., NAD 83:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; common fine roots; few fine tubular pores; neutral; abrupt smooth boundary.

A1—7 to 14 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common fine roots; few fine tubular pores; neutral; clear smooth boundary.

A2—14 to 24 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; few fine roots; few fine tubular pores; neutral; clear smooth boundary.

BA—24 to 32 inches; very dark gray (10YR 3/1) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine and very fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; common fine faint dark grayish brown (10YR 4/2) irregular iron depletions; common fine distinct dark yellowish brown (10YR 4/4) irregular masses of oxidized iron; neutral; gradual smooth boundary.

Bg1—32 to 39 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; common distinct very dark gray (10YR 3/1) organic stains on all faces of peds; many fine prominent yellowish brown (10YR 5/6) irregular masses of oxidized iron; slightly acid; gradual smooth boundary.

Bg2—39 to 50 inches; grayish brown (2.5Y 5/2) silty clay loam; strong medium prismatic structure parting to strong medium angular blocky; friable; few fine roots; few fine dendritic tubular pores; few distinct very dark gray (10YR 3/1) and

dark grayish brown (10YR 4/2) organic stains on surfaces along root channels; many fine distinct yellowish brown (10YR 5/6) irregular masses of oxidized iron; slightly acid; gradual smooth boundary.

BCg—50 to 62 inches; light olive brown (2.5Y 5/3) silty clay loam; weak medium prismatic structure; friable; few fine tubular pores; few distinct very dark gray (10YR 3/1) organic stains on surfaces along root channels; many fine prominent yellowish brown (10YR 5/6) irregular masses of oxidized iron; slightly acid; gradual smooth boundary.

Cg—62 to 80 inches; grayish brown (2.5Y 5/2) silt loam; massive; friable; few fine tubular pores; few distinct very dark gray (10YR 3/1) organic stains on surfaces along root channels; many medium prominent yellowish brown (10YR 5/6) masses of oxidized iron; common fine prominent black (10YR 2/1) irregular iron-manganese nodules; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 36 inches
Depth to carbonates: More than 48 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

BA horizon:
Hue—10YR
Value—3
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

Bg horizon (upper part):
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2
Texture—silty clay loam
Reaction—moderately acid to neutral

Bg horizon (lower part):
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silty clay loam
Reaction—moderately acid to neutral

Cg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silt loam, silty clay loam, loam, or clay loam
Reaction—moderately acid to neutral

Emeline Series

Typical Pedon

Emeline loam, 9 to 18 percent slopes, in a wooded area; Cedar County, Iowa; about 2,130 feet west and 60 feet south of the northeast corner of sec. 32, T. 82 N., R. 45 W.; USGS Cedar Bluff (IA) topographic quadrangle; lat. 41 degrees 52 minutes 27.5 seconds N. and long. 91 degrees 20 minutes 07.6 seconds W., NAD 83:

A—0 to 8 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; many very fine and fine roots; common very fine and fine dendritic tubular pores; few fragments of subangular limestone in the lower 4 inches (about 10 percent of soil volume); neutral; abrupt wavy boundary.
R—8 inches; indurated level-bedded limestone bedrock.

Range in Characteristics

Thickness of the mollic epipedon: 4 to 10 inches
Depth to bedrock: 4 to 10 inches
Other features: In some places the limestone bedrock is fractured and contains weathered fragments. Some pedons have a thin layer of clayey residuum over the bedrock.

A horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 to 3
Texture—loam, clay loam, or silt loam
Reaction—slightly acid to moderately alkaline

Fayette Series

Typical Pedon

Fayette silt loam, 5 to 9 percent slopes, in a wooded area; Cedar County, Iowa; about 930 feet west and 2,335 feet north of the southeast corner of sec. 19, T. 80 N., R. 3 W.; USGS Rochester (IA) topographic quadrangle; lat. 41 degrees 43 minutes 13.8 seconds N. and long. 91 degrees 13 minutes 59.9 seconds W., NAD 83:

A—0 to 4 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to moderate very fine and fine granular; friable; common very fine and fine roots; common very fine and fine dendritic tubular pores; slightly acid; clear smooth boundary.
E1—4 to 7 inches; about 90 percent dark grayish brown (10YR 4/2) and 10 percent dark gray (10YR 4/1) silt loam, light brownish gray (10YR 6/2) dry; moderate thin platy structure parting to weak very fine subangular blocky; friable; common very fine roots; common very fine dendritic tubular pores; moderately acid; clear smooth boundary.
E2—7 to 12 inches; about 80 percent dark grayish brown (10YR 4/2), 10 percent brown (10YR 4/3), and 10 percent dark gray (10YR 4/1) silt loam, light gray (10YR 7/2) dry; weak thin platy structure parting to weak very fine subangular blocky; friable; few very fine roots; few very fine dendritic tubular pores; moderately acid; clear smooth boundary.

Bt1—12 to 15 inches; about 75 percent brown (10YR 4/3) and 25 percent brown (10YR 5/3) silty clay loam; moderate very fine subangular blocky structure; friable; few very fine roots; few very fine tubular pores; few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—15 to 25 inches; brown (10YR 4/3) silty clay loam; moderate fine and medium subangular blocky structure; friable; many distinct brown (10YR 4/3) clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt3—25 to 38 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; many distinct brown (10YR 4/3) clay films on all faces of peds; common fine distinct black (10YR 2/1) (moist) irregular sharp manganese masses; strongly acid; gradual smooth boundary.

Bt4—38 to 49 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak fine prismatic structure parting to weak very fine subangular blocky; friable; common distinct brown (10YR 4/3) clay films on faces of peds and along surfaces of pores; common fine distinct black (10YR 2/1) (moist) irregular sharp manganese masses; strongly acid; gradual smooth boundary.

BC—49 to 80 inches; yellowish brown (10YR 5/4) silt loam; weak very coarse prismatic structure; friable; common fine distinct black (10YR 2/1) (moist) irregular sharp manganese masses; strongly acid.

Range in Characteristics

Depth to carbonates: More than 40 inches

A horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 or 2
- Texture—silt loam
- Reaction—moderately acid to neutral

Ap horizon (where present):
- Hue—10YR
- Value—4
- Chroma—2 or 3
- Texture—silt loam
- Reaction—moderately acid to neutral

E horizon:
- Hue—10YR
- Value—4 or 5
- Chroma—1 to 4
- Texture—silt loam
- Reaction—strongly acid to slightly acid

BE horizon:
- Hue—10YR
- Value—4 or 5
- Chroma—3 or 4
- Texture—silt loam or silty clay loam
- Reaction—strongly acid to slightly acid

Bt horizon:
- Hue—10YR
- Value—4 or 5

Chroma—3 to 6
Texture—silty clay loam or silt loam
Reaction—very strongly acid to moderately acid

BC or C horizon:
Hue—10YR
Value—4 or 5
Chroma—4 to 6
Texture—silt loam or silty clay loam
Reaction—very strongly acid to moderately acid

Franklin Series

Typical Pedon

Franklin silt loam, 1 to 3 percent slopes, in a cultivated field; Cedar County, Iowa; about 755 feet east and 755 feet north of the southwest corner of sec. 18, T. 82 N., R. 2 W.; USGS Stanwood (IA) topographic quadrangle; lat. 41 degrees 54 minutes 18.7 seconds N. and long. 91 degrees 07 minutes 45.9 seconds W., NAD 83:

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; few fine roots; few fine dendritic tubular pores; neutral; abrupt smooth boundary.

E—9 to 14 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak thick platy structure parting to weak fine granular; friable; few fine roots; few fine dendritic tubular pores; few distinct very dark gray (10YR 3/1) organic stains on bottom faces of peds; strongly acid; clear smooth boundary.

Bt1—14 to 22 inches; dark grayish brown (10YR 4/2) silty clay loam; weak fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; common distinct dark gray (10YR 4/1) clay films on all faces of peds; few fine prominent yellowish brown (10YR 5/6) masses of oxidized iron; strongly acid; clear smooth boundary.

Bt2—22 to 33 inches; grayish brown (2.5Y 5/2) silty clay loam; weak fine and medium subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; common distinct gray (2.5Y 5/1) clay films on all faces of peds; common medium prominent strong brown (7.5YR 4/6) masses of oxidized iron; moderately acid; clear smooth boundary.

Bt3—33 to 39 inches; grayish brown (2.5Y 5/2) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; few fine dendritic tubular pores; few distinct gray (2.5Y 5/1) clay films on all faces of peds; few distinct light gray (10YR 7/1) (dry) silt coatings on all faces of peds; few medium distinct black (10YR 2/1) iron-manganese masses; many medium prominent yellowish brown (10YR 5/6) masses of oxidized iron; moderately acid; abrupt smooth boundary.

2BC1—39 to 43 inches; dark yellowish brown (10YR 4/6) sandy clay loam; weak fine subangular blocky structure; friable; few fine prominent black (10YR 2/1) iron-manganese masses; common medium prominent light brownish gray (2.5Y 6/2) masses of reduced iron; neutral; abrupt smooth boundary.

2BC2—43 to 49 inches; yellowish brown (10YR 5/6) loam; weak coarse prismatic structure; friable; common fine prominent black (10YR 2/1) iron-manganese masses; many very coarse faint light olive brown (2.5Y 5/6) masses of oxidized iron; neutral; gradual smooth boundary.

2C1—49 to 69 inches; yellowish brown (10YR 5/6) loam; massive; friable; few coarse prominent black (10YR 2/1) iron-manganese masses; many coarse prominent light olive gray (5Y 6/2) masses of reduced iron; neutral; clear smooth boundary.
2C2—69 to 80 inches; about 80 percent light brownish gray (2.5Y 6/2) and 20 percent dark yellowish brown (10YR 4/6) loam; massive; friable; few coarse prominent black (10YR 2/1) iron-manganese masses; neutral.

Range in Characteristics

Depth to carbonates: More than 48 inches
Thickness of the loess mantle: 20 to 40 inches
Other features: In most pedons, a stone line or a thin lens of sandy material separates the silty upper part of the B horizon from the loamy lower part.

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam
Reaction—slightly acid or neutral

E horizon:
Hue—10YR
Value—4 or 5
Chroma—1 or 2
Texture—silt loam
Reaction—strongly acid to slightly acid

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silty clay loam
Reaction—loam

2Bt horizon (where present):
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—2 to 8
Texture—loam, clay loam, or sandy clay loam
Reaction—slightly acid to moderately alkaline

2BC and 2C horizons:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—2 to 8
Texture—loam or sandy clay loam
Reaction—slightly acid to moderately alkaline

Gara Series

Typical Pedon

Gara loam, on a convex slope of 11 percent, in a deciduous forest; Wayne County, Iowa; about 2 miles east of Lineville; about 900 feet east and 1,600 feet south of the northwest corner of sec. 23, T. 67 N., R. 23 W.; USGS Cleopatra topographic

quadrangle; lat. 40 degrees 35 minutes 24 seconds N. and long. 93 degrees 28 minutes 38 seconds W., NAD 83:

A—0 to 7 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; weak very fine granular structure; friable; moderately acid; clear smooth boundary.

E—7 to 12 inches; dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure parting to weak medium platy; friable; few very dark gray (10YR 3/1) wormcasts; about 2 percent rock fragments (1 to 3 inches in diameter); moderately acid; clear smooth boundary.

Bt1—12 to 17 inches; dark yellowish brown (10YR 4/4) loam; moderate fine subangular blocky structure; friable; few very dark grayish brown (10YR 3/2) wormcasts; common brown (10YR 4/3) clay films on faces of peds; few distinct grayish brown (10YR 5/2) (dry) silt and very fine sand coatings on faces of peds; about 3 percent rock fragments; strongly acid; clear smooth boundary.

Bt2—17 to 24 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common distinct brown (10YR 4/3) clay films on faces of peds; few fine dark concretions; about 3 percent rock fragments; strongly acid; gradual smooth boundary.

Bt3—24 to 33 inches; dark yellowish brown (10YR 4/4) clay loam; weak medium prismatic structure parting to weak and moderate medium subangular blocky; firm; common distinct brown (10YR 4/3) clay films on faces of peds; few fine black (10YR 2/1) concretions; few fine distinct grayish brown (2.5Y 5/2) redoximorphic depletions; about 3 percent rock fragments; strongly acid; gradual smooth boundary.

Bt4—33 to 45 inches; yellowish brown (10YR 5/4) clay loam; weak medium prismatic structure parting to weak medium and coarse subangular and angular blocky; firm; few dark yellowish brown (10YR 4/4) clay films on vertical faces of peds and along surfaces of pores; few fine distinct grayish brown (2.5Y 5/2) redoximorphic depletions; about 3 percent rock fragments; slightly acid; clear smooth boundary.

BC—45 to 80 inches; yellowish brown (10YR 5/6) and grayish brown (2.5Y 5/2) clay loam; extremely coarse prismatic structure dissected by few oblique fractures; firm; few fine carbonate concretions; about 3 percent rock fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 30 to 70 inches

A or Ap horizon:
- Hue—10YR
- Value—3
- Chroma—1 to 3
- Texture—loam, silt loam, clay loam, or fine sandy loam
- Content of rock fragments—1 to 10 percent
- Reaction—moderately acid to neutral

E horizon (where present) or BE horizon (where present):
- Hue—10YR
- Value—3 to 5
- Chroma—2 to 4
- Texture—loam, silt loam, or clay loam
- Content of rock fragments—1 to 10 percent
- Reaction—moderately acid to neutral

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—loam or clay loam
Content of rock fragments—1 to 10 percent
Reaction—very strong acid to neutral

Btk horizon (where present):
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—clay loam
Content of rock fragments—1 to 10 percent
Reaction—slightly alkaline or moderately alkaline

BC or C horizon (where present):
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 6
Texture—clay loam or loam
Content of rock fragments—1 to 10 percent
Reaction—slightly acid to moderately alkaline

Taxadjunct features: The representative pedon for the severely eroded Gara soil in map unit 162E3 is a taxadjunct because the surface layer does not meet the requirements for the Mollic subgroup. This pedon is classified as a fine-loamy, mixed, superactive, mesic Typic Hapludalf.

Garwin Series

Typical Pedon

Garwin silty clay loam, 0 to 2 percent slopes, in a cultivated field; Cedar County, Iowa; about 500 feet south and 920 feet east of the northwest corner of sec. 13, T. 80 N., R. 1 W.; USGS Bennett (IA) topographic quadrangle; lat. 41 degrees 44 minutes 27.5 seconds N. and long. 90 degrees 54 minutes 52.4 seconds W., NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

A1—8 to 14 inches; black (N 2/) silty clay loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; moderately acid; clear smooth boundary.

A2—14 to 22 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; moderately acid; clear smooth boundary.

Bg1—22 to 31 inches; dark gray (10YR 4/1) silty clay loam; moderate fine subangular blocky structure; friable; many distinct very dark gray (10YR 3/1) and dark grayish brown (10YR 4/2) organic stains on all faces of peds; few fine prominent dark yellowish brown (10YR 4/6) masses of oxidized iron; moderately acid; gradual smooth boundary.

Bg2—31 to 37 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate fine angular blocky structure; friable; common distinct dark grayish brown (10YR 4/2) and very dark gray (10YR 3/1) organic stains on all faces of peds; few medium prominent yellowish brown (10YR 5/6) masses of oxidized iron; moderately acid; gradual smooth boundary.

Bg3—37 to 52 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few distinct very dark gray (10YR 3/1) organic stains on surfaces along root channels; few medium prominent dark yellowish brown (10YR 4/6) masses of oxidized iron; moderately acid; gradual smooth boundary.

BCg—52 to 72 inches; olive gray (5Y 5/2) silt loam; weak fine prismatic structure parting to weak fine subangular blocky; friable; few distinct very dark gray (10YR 3/1) organic stains on surfaces along root channels; many coarse prominent dark yellowish brown (10YR 4/6) masses of oxidized iron; slightly acid; gradual smooth boundary.

C—72 to 80 inches; olive gray (5Y 5/2) silt loam; massive; many coarse prominent dark yellowish brown (10YR 4/6) masses of oxidized iron; friable; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 18 to 24 inches
Depth to carbonates: More than 48 inches

Ap or A1 horizon:
Hue—10YR, 5Y, or N
Value—2
Chroma—0 or 1
Texture—silty clay loam
Reaction—moderately acid to neutral

A2 horizon:
Hue—10YR, 5Y, or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam
Reaction—moderately acid to neutral

Bg horizon (upper part):
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—1
Texture—silty clay loam
Reaction—moderately acid to neutral

Bg horizon (lower part):
Hue—2.5Y or 5Y
Value—3 to 5
Chroma—1 or 2
Texture—silty clay loam
Reaction—moderately acid to neutral

BCg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay loam or silt loam
Reaction—moderately acid to neutral

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2

Texture—silt loam
Reaction—slightly acid to slightly alkaline

Greenbush Series

Typical Pedon

Greenbush silt loam, on a south-facing, linear slope of 2 percent, in a pasture; Warren County, Illinois; about 0.5 mile west and 2.25 miles south of Greenbush; 1,430 feet west and 1,400 feet north of the southeast corner of sec. 18, T. 8 N., R. 1 W.; USGS Greenbush topographic quadrangle; lat. 40 degrees 40 minutes 40 seconds N. and long. 90 degrees 32 minutes 47 seconds W., NAD 27:

Ap—0 to 6 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

E—6 to 10 inches; dark grayish brown (10YR 4/2) silt loam; weak thin platy structure; friable; common faint very dark gray (10YR 3/1) organic coatings on faces of peds; moderately acid; abrupt smooth boundary.

BE—10 to 17 inches; brown (10YR 4/3) silt loam; moderate medium platy structure parting to weak fine subangular blocky; friable; few distinct very dark gray (10YR 3/1) organic coatings and common distinct gray (10YR 6/1) (dry) silt coatings on faces of peds; moderately acid; clear smooth boundary.

Bt1—17 to 29 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium prismatic structure parting to moderate fine and medium angular blocky; friable; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; common distinct gray (10YR 6/1) (dry) silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt2—29 to 38 inches; brown (10YR 5/3) silty clay loam; weak medium prismatic structure parting to moderate fine angular blocky; friable; common faint brown (10YR 4/3) clay films on faces of peds; many faint light gray (10YR 7/2) (dry) silt coatings on faces of peds; common medium distinct yellowish brown (10YR 5/6) masses of iron in the matrix; common medium prominent gray (5Y 6/1) iron depletions within peds; common prominent black (7.5YR 2/1) manganese oxide stains within the matrix; strongly acid; gradual wavy boundary.

Bt3—38 to 53 inches; brown (10YR 5/3) silty clay loam; weak medium prismatic structure parting to moderate fine angular blocky; friable; common faint brown (10YR 4/3) clay films on faces of peds; many distinct light gray (10YR 7/2) (dry) silt coatings on faces of peds; common medium distinct yellowish brown (10YR 5/6) masses of iron in the matrix; common medium prominent gray (5Y 6/1) iron depletions within peds; common prominent black (7.5YR 2/1) manganese oxide stains within the matrix; strongly acid; gradual wavy boundary.

BCt—53 to 75 inches; about 60 percent brown (10YR 5/3) and 40 percent light olive gray (5Y 6/2) silt loam; weak medium and coarse prismatic structure parting to weak fine and medium angular blocky; friable; few faint brown (10YR 4/3) clay films on faces of peds; few faint light gray (10YR 7/2) (dry) silt coatings on faces of peds; common medium distinct yellowish brown (10YR 5/6) masses of iron within peds; common prominent black (7.5YR 2/1) manganese oxide stains within the matrix; moderately acid; gradual wavy boundary.

C—75 to 80 inches; about 55 percent yellowish brown (10YR 5/4) and 45 percent light olive gray (5Y 6/2) silt loam; massive; friable; many medium distinct light brownish gray (10YR 6/2) iron depletions within peds; many prominent black (7.5YR 2/1) manganese oxide stains within the matrix; moderately acid.

Range in Characteristics

Depth to carbonates: More than 60 inches

A or Ap horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 or 2
- Texture—silt loam or silty clay loam
- Reaction—strongly acid to neutral

E horizon (where present):
- Hue—10YR
- Value—3 to 5
- Chroma—2 or 3
- Texture—silt loam
- Reaction—strongly acid to neutral

Bt horizon:
- Hue—10YR
- Value—4 or 5
- Chroma—3 to 6
- Texture—silty clay loam or silt loam
- Reaction—very strongly acid to neutral

C horizon:
- Hue—10YR, 2.5Y, or 5Y
- Value—4 to 6
- Chroma—2 to 6
- Texture—silt loam
- Reaction—moderately acid to neutral

Taxadjunct features: The representative pedon for the severely eroded Greenbush soil in map unit 162D3 is a taxadjunct because the surface layer does not meet the requirements for the Mollic subgroup. This pedon is classified as a fine-silty, mixed, superactive, mesic Typic Hapludalf.

Hanlon Series

Typical Pedon

Hanlon fine sandy loam, on a nearly level flood plain adjacent to the Cedar River, in a meadow; Mitchell County, Iowa; about 1 mile west of St. Ansgar; about 100 feet north and 2,315 feet west of the southeast corner of sec. 23, T. 99 N., R. 18 W.; USGS Osage SW (IA) topographic quadrangle; lat. 43 degrees 22 minutes 18 seconds N. and long. 92 degrees 56 minutes 02 seconds W., NAD 83:

A1—0 to 7 inches; black (10YR 2/1) fine sandy loam, very dark gray (10YR 3/1) dry; weak very fine subangular blocky structure parting to weak fine granular; very friable; neutral; clear smooth boundary.

A2—7 to 27 inches; black (10YR 2/1) fine sandy loam, very dark gray (10YR 3/1) dry; weak fine and medium subangular blocky structure; very friable; neutral; clear smooth boundary.

A3—27 to 40 inches; black (10YR 2/1) fine sandy loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; very friable; neutral; clear smooth boundary.

A4—40 to 50 inches; very dark brown (10YR 2/2) fine sandy loam grading to medium sandy loam with increasing depth, dark grayish brown (10YR 4/2) dry; weak medium and coarse subangular blocky structure; very friable; neutral; gradual smooth boundary.
Bt—50 to 69 inches; very dark grayish brown (10YR 3/2) sandy loam; weak medium and coarse subangular blocky structure; friable; some clay bridging between sand grains; very dark brown (10YR 2/2) coatings on faces of peds; neutral; abrupt wavy boundary.
BC—69 to 80 inches; dark grayish brown (10YR 4/2) loam; weak coarse prismatic structure; friable; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 40 to 71 inches
Depth to carbonates: More than 48 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam or sandy loam
Reaction—slightly acid or neutral

Bt horizon:
Hue—10YR
Value—3 or 4
Chroma—1 or 2
Texture—fine sandy loam or sandy loam
Reaction—slightly acid or neutral

BC horizon or BCg horizon (where present):
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—1 or 2
Texture—sandy loam, loam, loamy sand, or sand
Reaction—moderately acid to slightly alkaline

Hoopeston Series

Typical Pedon

Hoopeston sandy loam, in a cultivated field; Whiteside County, Illinois; about 2.25 miles northeast of Spring Hill; 2,530 feet south and 1,060 feet east of the northwest corner of sec. 14, T. 19 N., R. 4 E.; USGS Erie topographic quadrangle; lat. 41 degrees 38 minutes 04 seconds N. and long. 90 degrees 00 minutes 45 seconds W., NAD 27:

Ap—0 to 10 inches; black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; very friable; common very fine roots throughout; neutral; clear smooth boundary.
A—10 to 14 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak medium and fine subangular blocky structure; very friable; common very fine roots throughout; common faint very dark brown (10YR 2/2) organic coatings on faces of peds; neutral; clear smooth boundary.
Bw1—14 to 21 inches; brown (10YR 5/3) sandy loam; weak medium subangular blocky structure; very friable; few very fine roots between peds; few faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds and in root

channels; common fine faint dark grayish brown (10YR 4/2) iron depletions; common fine distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; neutral; clear smooth boundary.

Bw2—21 to 38 inches; brown (10YR 5/3) sandy loam; weak coarse subangular blocky structure; very friable; few very fine roots between peds; common fine faint grayish brown (10YR 5/2) iron depletions; common fine prominent yellowish brown (10YR 5/8) masses of iron oxide in the matrix; slightly acid; abrupt smooth boundary.

C—38 to 60 inches; pale brown (10YR 6/3) sand; single grain; loose; common fine faint light brownish gray (10YR 6/2) iron depletions; common fine prominent yellowish brown (10YR 5/8) masses of iron oxide in the matrix; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Depth to carbonates: More than 40 inches

Ap or A horizon:
- Hue—7.5YR or 10YR
- Value—2 or 3
- Chroma—1 to 3
- Texture—sandy loam, fine sandy loam, or loam
- Reaction—strongly acid to neutral

Bw or Bg horizon:
- Hue—7.5YR to 2.5Y
- Value—4 to 6
- Chroma—1 to 6
- Texture—fine sandy loam or sandy loam; some strata of loamy sand, loamy fine sand, loam, sandy clay loam, silt loam, or sand
- Reaction—strongly acid to slightly alkaline

C or Cg horizon:
- Hue—7.5YR to 5Y
- Value—3 to 6
- Chroma—1 to 8
- Texture—loamy fine sand, loamy sand, fine sand, or sand
- Reaction—very strongly acid to moderately alkaline

Judson Series

Typical Pedon

Judson silty clay loam, 2 to 5 percent slopes, in a cultivated field; Cedar County, Iowa; about 2,465 feet north and 800 feet east of the southwest corner of sec. 30, T. 79 N., R. 4 W.; USGS West Liberty (IA) topographic quadrangle; lat. 41 degrees 37 minutes 10.9 seconds N. and long. 91 degrees 21 minutes 48.8 seconds W., NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots; few fine dendritic tubular pores; slightly acid; abrupt smooth boundary.

A1—8 to 17 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; slightly acid; gradual smooth boundary.

A2—17 to 25 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; slightly acid; gradual smooth boundary.

AB—25 to 33 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; slightly acid; gradual smooth boundary.

Bw1—33 to 42 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; few very fine roots; few fine dendritic tubular pores; slightly acid; gradual smooth boundary.

Bw2—42 to 58 inches; brown (10YR 5/3) silty clay loam; moderate fine subangular blocky structure; friable; few very fine roots; few fine dendritic tubular pores; common fine faint grayish brown (10YR 5/2) iron depletions; common fine distinct dark yellowish brown (10YR 4/6) masses of oxidized iron; slightly acid; gradual smooth boundary.

BC—58 to 68 inches; brown (10YR 5/3) silty clay loam; weak coarse subangular blocky structure; friable; common fine faint grayish brown (10YR 5/2) iron depletions; common fine distinct dark yellowish brown (10YR 4/6) masses of oxidized iron; slightly acid; gradual smooth boundary.

C—68 to 80 inches; brown (10YR 4/3) silty clay loam; massive; friable; few fine black (10YR 2/1) iron-manganese masses; common fine faint grayish brown (10YR 5/2) iron depletions; many fine distinct dark yellowish brown (10YR 4/6) masses of oxidized iron; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 32 to 60 inches

Ap or A horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 or 2
- Texture—silty clay loam or silt loam
- Reaction—moderately acid to neutral

AB horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—2
- Texture—silty clay loam
- Reaction—moderately acid to neutral

Bw or Bt horizon:
- Hue—10YR
- Value—3 to 5
- Chroma—3 to 5
- Texture—silty clay loam
- Reaction—moderately acid to neutral

BC horizon:
- Hue—10YR
- Value—3 to 5
- Chroma—3 or 4
- Texture—silty clay loam or silt loam
- Reaction—slightly acid to slightly alkaline

C horizon:
- Hue—10YR
- Value—3 to 5
- Chroma—3 or 4
- Texture—silty clay loam or silt loam
- Reaction—slightly acid to slightly alkaline

Kennebec Series

Typical Pedon

Kennebec silt loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; Cedar County, Iowa; about 330 feet south and 2,510 feet east of the northwest corner of sec. 35, T. 80 N., R. 2 W.; USGS Lime City (IA) topographic quadrangle; lat. 41 degrees 41 minutes 53.2 seconds N. and long. 91 degrees 02 minutes 43.6 seconds W., NAD 83:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common fine roots; few fine dendritic tubular pores; neutral; abrupt smooth boundary.

A1—8 to 17 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; friable; common fine roots; few fine dendritic tubular pores; common distinct very dark gray (10YR 3/1) organic stains on all faces of peds; slightly acid; clear smooth boundary.

A2—17 to 26 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/2) dry; moderate medium subangular blocky structure; friable; common fine roots; few fine dendritic tubular pores; few distinct very dark gray (10YR 3/1) organic stains on all faces of peds; slightly acid; clear smooth boundary.

A3—26 to 34 inches; very dark brown (10YR 2/2) silt loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure parting to moderate medium granular; friable; few fine roots; few fine dendritic tubular pores; few distinct black (10YR 2/1) organic stains on all faces of peds; slightly acid; clear smooth boundary.

A4—34 to 46 inches; very dark brown (10YR 2/2) silt loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots; few fine dendritic tubular pores; few distinct black (10YR 2/1) organic stains on all faces of peds; slightly acid; gradual smooth boundary.

Bw1—46 to 56 inches; very dark grayish brown (10YR 3/2) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; few fine faint dark grayish brown (10YR 4/2) iron depletions; slightly acid; gradual smooth boundary.

Bw2—56 to 68 inches; very dark grayish brown (10YR 3/2) silt loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; few fine faint dark grayish brown (10YR 4/2) iron depletions; slightly acid; gradual smooth boundary.

BC—68 to 80 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/2) dry; weak fine prismatic structure parting to weak fine subangular blocky; friable; common fine faint dark gray (10YR 4/1) iron depletions; common fine prominent dark yellowish brown (10YR 3/6) masses of oxidized iron; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: More than 40 inches
Depth to carbonates: More than 80 inches

Ap or A horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 or 2
- Texture—silt loam or silty clay loam
- Reaction—moderately acid to neutral

Bw horizon:
- Hue—10YR or 2.5Y

Value—2 to 4
Chroma—2 or 3
Texture—silt loam or silty clay loam
Reaction—slightly acid or neutral

BC or C horizon (where present):
Hue—10YR or 2.5Y
Value—2 to 4
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—slightly acid or neutral

Kenyon Series

Typical Pedon

Kenyon loam, 2 to 5 percent slopes, in a cultivated field; Cedar County, Iowa; about 394 feet south and 1,722 feet west of the northeast corner of sec. 16, T. 82 N., R. 1 W.; USGS Oxford Junction (IA) topographic quadrangle; lat. 41 degrees 54 minutes 59.2 seconds N. and long. 90 degrees 57 minutes 41.8 seconds W., NAD 83:

Ap—0 to 6 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common medium roots; many medium tubular pores; slightly acid; abrupt smooth boundary.

A1—6 to 11 inches; very dark brown (10YR 2/2) silt loam, very dark grayish brown (10YR 3/2) dry; weak fine granular and weak fine subangular blocky structure; friable; common fine roots; common fine tubular pores; moderately acid; clear smooth boundary.

A2—11 to 17 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; friable; common fine roots; common fine tubular pores; moderately acid; clear smooth boundary.

2Bw1—17 to 24 inches; brown (10YR 4/3) loam; moderate fine subangular blocky structure; friable; common fine roots; common fine tubular pores; few distinct very dark grayish brown (10YR 3/2) organic stains on all faces of peds; moderately acid; abrupt smooth boundary.

2Bw2—24 to 33 inches; dark yellowish brown (10YR 4/4) loam; weak fine prismatic structure parting to moderate fine subangular blocky; firm; common fine roots; common fine tubular pores; slightly acid; clear smooth boundary.

2Bw3—33 to 44 inches; about 90 percent yellowish brown (10YR 5/4) and 10 percent grayish brown (10YR 5/2) loam; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; common fine roots in cracks; common very fine tubular pores; slightly acid; clear smooth boundary.

2Bw4—44 to 51 inches; about 60 percent yellowish brown (10YR 5/6) and 40 percent grayish brown (2.5Y 5/2) loam; moderate coarse prismatic structure; firm; few fine roots in cracks; few very fine tubular pores; neutral; clear smooth boundary.

2BC1—51 to 63 inches; dark yellowish brown (10YR 4/6) loam; weak coarse prismatic structure; firm; common medium black (10YR 2/1) iron-manganese masses; many coarse faint strong brown (7.5YR 4/6) irregular masses of oxidized iron; common medium prominent light brownish gray (2.5Y 6/2) iron depletions; about 3 percent subrounded gravel; slightly effervescent; moderately alkaline; clear smooth boundary.

2BC2—63 to 72 inches; grayish brown (2.5Y 5/2) loam; weak coarse prismatic structure; firm; few distinct dark grayish brown (10YR 4/2) organic stains on surfaces along root channels; few medium black (10YR 2/1) iron-manganese

masses; common medium faint light brownish gray (2.5Y 6/2) iron depletions; about 3 percent subrounded gravel; slightly effervescent; moderately alkaline; clear smooth boundary.

2C—72 to 80 inches; dark yellowish brown (10YR 4/6) loam; massive; firm; common coarse prominent light brownish gray (2.5Y 6/2) iron depletions; about 3 percent subrounded gravel; violently effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to till: 12 to 26 inches
Depth to carbonates: More than 45 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam or silt loam
Reaction—strongly acid to neutral

AB or BA horizon (where present):
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—loam, silt loam, or sandy clay loam
Reaction—strongly acid to slightly acid

2Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 6
Texture—loam, clay loam, or sandy clay loam
Reaction—strongly acid to neutral

2BC or 2C horizon (where present):
Hue—7.5YR to 5Y
Value—4 to 8
Chroma—1 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline

Taxadjunct features: The representative pedons for the moderately eroded and severely eroded Kenyon soils in map units 83C, 83C2, and 377C2 are taxadjuncts because the surface layer does not meet the thickness requirements for a Mollisol. These pedons are classified as fine-loamy, mixed, superactive, mesic Dystric Eutrudepts.

Keswick Series

Typical Pedon

Keswick loam, 9 to 14 percent slopes, moderately eroded, in a pasture; Iowa County, Iowa; about 565 feet south and 2,240 feet west of the northeast corner of sec. 26, T. 79 N., R. 11 W.; USGS Williamsburg NW (IA) topographic quadrangle; lat. 41 degrees 37 minutes 43.1 seconds N. and long. 92 degrees 12 minutes 36.6 seconds W., NAD 83:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many fine roots; few fine tubular pores; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; clear smooth boundary.

BE—7 to 13 inches; brown (10YR 4/3) loam; weak thin platy structure parting to moderate fine subangular blocky; friable; many fine roots; few fine tubular pores; common distinct dark brown (10YR 3/3) organic coatings on faces of peds; strongly acid; abrupt smooth boundary.

2Bt1—13 to 24 inches; yellowish red (5YR 4/6) clay loam; moderate fine and medium subangular blocky structure; firm; common fine roots; few fine tubular pores; common distinct reddish brown (5YR 4/4) clay films on faces of peds; about 3 percent subrounded gravel; strongly acid; clear smooth boundary.

2Bt2—24 to 37 inches; strong brown (7.5YR 4/6) clay; moderate medium subangular blocky structure; firm; common fine roots; few fine tubular pores; common distinct brown (7.5YR 4/4) clay films on faces of peds; about 2 percent subrounded gravel; common fine faint yellowish red (5YR 4/6) redoximorphic concentrations; common fine prominent light brownish gray (10YR 6/2) redoximorphic depletions; strongly acid; clear smooth boundary.

2Bt3—37 to 52 inches; yellowish brown (10YR 5/6) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few fine tubular pores; common distinct brown (7.5YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/2) silt coatings on faces of peds; few black (10YR 2/1) iron and manganese concretions; about 2 percent subrounded gravel; common fine distinct yellowish red (5YR 4/6) redoximorphic concentrations; common fine prominent light brownish gray (10YR 6/2) redoximorphic depletions; slightly acid; gradual smooth boundary.

2BC—52 to 70 inches; yellowish brown (10YR 5/6) clay loam; moderate medium prismatic structure; firm; few fine roots; few fine tubular pores; few distinct brown (7.5YR 4/4) clay films on faces of peds; very few distinct light gray (10YR 7/2) silt coatings on faces of peds; few black (10YR 2/1) iron and manganese concretions; about 5 percent subrounded gravel; common fine distinct yellowish red (5YR 4/6) redoximorphic concentrations; common fine prominent light brownish gray (10YR 6/2) redoximorphic depletions; slightly acid; gradual smooth boundary.

2C—70 to 80 inches; yellowish brown (10YR 5/6) clay loam; massive; firm; about 3 percent subrounded gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 40 to 75 inches

Ap or A horizon:
- Hue—10YR
- Value—2 to 4
- Chroma—1 or 2
- Texture—loam, silt loam, or clay loam
- Reaction—strongly acid to neutral

E horizon (where present):
- Hue—10YR
- Value—4 or 5
- Chroma—2 or 3
- Texture—loam, silt loam, or clay loam
- Reaction—very strongly acid to slightly acid

BE horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—loam, silt loam, or clay loam
Reaction—very strongly acid to slightly acid

2Bt horizon (upper part):
Hue—5YR or 7.5YR
Value—4 or 5
Chroma—3 to 6
Texture—clay or clay loam
Reaction—very strongly acid to moderately acid
Other features—a pebble band typically occurs at the top of this horizon

2Bt horizon (lower part) and 2BC horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—1 to 6
Texture—clay or clay loam
Reaction—very strongly acid to slightly alkaline

2C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 or 5
Chroma—1 to 6
Texture—clay loam
Reaction—slightly acid to moderately alkaline

Klinger Series

Typical Pedon

Klinger silty clay loam, 1 to 3 percent slopes, in a cultivated field; Cedar County, Iowa; about 1,570 feet north and 1,220 feet west of the southeast corner of sec. 13, T. 82 N., R. 3 W.; USGS Stanwood (IA) topographic quadrangle; lat. 41 degrees 54 minutes 26.5 seconds N. and long. 91 degrees 08 minutes 10.6 seconds W., NAD 83:

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

A—9 to 15 inches; very dark brown (10YR 2/2) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; few fine roots in cracks; few fine dendritic tubular pores; strongly acid; gradual smooth boundary.

BA—15 to 19 inches; very dark grayish brown (2.5Y 3/2) silty clay loam, dark grayish brown (2.5Y 4/2) dry; moderate fine subangular blocky structure; friable; few very fine roots between peds; few very fine dendritic tubular pores; many prominent very dark gray (10YR 3/1) organoargillans on vertical faces of peds; moderately acid; gradual smooth boundary.

Bg1—19 to 27 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate fine subangular blocky structure; friable; few distinct very dark grayish brown (10YR 3/2) organic stains on all faces of peds; few fine prominent dark yellowish brown (10YR 4/6) irregular masses of oxidized iron; slightly acid; gradual smooth boundary.

Bg2—27 to 38 inches; grayish brown (2.5Y 5/2) silty clay loam; weak medium prismatic structure parting to moderate fine subangular blocky; friable; common medium prominent light olive brown (2.5Y 5/6) irregular masses of oxidized iron; slightly acid; abrupt smooth boundary.

2Bg3—38 to 47 inches; grayish brown (2.5Y 5/2) loam; weak coarse prismatic structure; firm; many extremely coarse prominent yellowish brown (10YR 5/6) masses of oxidized iron; stone line at a depth of 38 to 40 inches; slightly acid; gradual smooth boundary.

2BC—47 to 65 inches; about 60 percent yellowish brown (10YR 5/6) and 40 percent light brownish gray (2.5Y 6/2) loam; weak coarse prismatic structure; firm; neutral; gradual smooth boundary.

2C—65 to 80 inches; about 70 percent yellowish brown (10YR 5/6) and 30 percent light brownish gray (2.5Y 6/2) loam; massive; firm; moderately effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 14 to 20 inches
Depth to till: 20 to 40 inches
Depth to carbonates: More than 45 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—strongly acid to neutral

AB horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—strongly acid to neutral

Bg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silty clay loam
Reaction—strongly acid to slightly acid

2Bg horizon:
Hue—2.5Y
Value—5 or 6
Chroma—2 to 6
Texture—loam
Reaction—strongly acid to slightly alkaline

2BC and 2C horizons:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—loam
Reaction—slightly acid to moderately alkaline

Klingmore Series

Typical Pedon

Klingmore silty clay loam, 1 to 3 percent slopes, in a cultivated field; Cedar County, Iowa; about 230 feet north and 2,200 feet east of the southwest corner of sec. 14, T. 82 N., R. 3 W.; USGS Stanwood (IA) topographic quadrangle; lat. 41 degrees 54 minutes 13.3 seconds N. and long. 91 degrees 09 minutes 50.2 seconds W., NAD 83:

Ap—0 to 7 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; few fine roots; common fine dendritic tubular pores; slightly acid; abrupt smooth boundary.

A1—7 to 11 inches; black (10YR 2/1) silty clay loam, very dark grayish brown (10YR 3/2) dry; moderate fine subangular blocky structure; friable; few fine roots; common fine dendritic tubular pores; slightly acid; gradual smooth boundary.

A2—11 to 18 inches; very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) dry; moderate fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; slightly acid; gradual smooth boundary.

Btg1—18 to 26 inches; dark grayish brown (10YR 4/2) silty clay loam; weak fine subangular blocky structure; friable; few fine roots between peds; few fine dendritic tubular pores; common distinct dark gray (10YR 4/1) clay films on all faces of peds; few distinct very dark grayish brown (10YR 3/2) organic stains on all faces of peds; moderately acid; gradual smooth boundary.

Btg2—26 to 34 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots between peds; few fine dendritic tubular pores; common distinct dark grayish brown (10YR 4/2) clay films on all faces of peds; few fine prominent dark yellowish brown (10YR 4/6) irregular masses of oxidized iron; neutral; gradual smooth boundary.

Btg3—34 to 39 inches; grayish brown (2.5Y 5/2) silty clay loam; strong medium subangular blocky structure; friable; few fine roots between peds; few fine dendritic tubular pores; common distinct dark grayish brown (10YR 4/2) clay films on vertical faces of peds; common medium prominent dark yellowish brown (10YR 4/6) irregular masses of oxidized iron; neutral; gradual smooth boundary.

Btg4—39 to 55 inches; grayish brown (2.5Y 5/2) silty clay loam; weak fine subangular blocky structure; friable; few fine roots between peds; few fine dendritic tubular pores; common distinct dark gray (10YR 4/1) clay films on all faces of peds; few fine prominent black (10YR 2/1) spherical manganese masses; many medium prominent dark yellowish brown (10YR 4/6) irregular masses of oxidized iron; neutral; abrupt smooth boundary.

2BCg—55 to 59 inches; about 60 percent grayish brown (2.5Y 5/2) and 40 percent dark yellowish brown (10YR 4/4) sandy clay loam; weak fine subangular blocky structure; friable; many medium prominent dark yellowish brown (10YR 4/6) irregular masses of oxidized iron; neutral; abrupt smooth boundary.

2BC—59 to 80 inches; about 70 percent light olive brown (2.5Y 5/3) and 30 percent yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure parting to weak fine subangular blocky; friable; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 14 to 20 inches
Depth to till: 40 to 60 inches
Depth to carbonates: More than 40 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silty clay loam or silt loam
Reaction—strongly acid to neutral

Btg horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam
Reaction—strongly acid to neutral

2Btg horizon (where present) and 2BCg horizon (where present):
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—1 to 8
Texture—loam, clay loam, or sandy clay loam
Reaction—strongly acid to neutral

2BC horizon:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—1 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline

Klossner Series

Typical Pedon

Klossner muck, 1 to 3 percent slopes, in a marsh; Cedar County, Iowa; about 600 feet south and 300 feet west of the northeast corner of sec. 23, T. 79 N., R. 4 W.; USGS West Branch (IA) topographic quadrangle; lat. 41 degrees 38 minutes 23.8 seconds N. and long. 91 degrees 16 minutes 12 seconds W., NAD 83:

Oa1—0 to 6 inches; black (N 2.5/) muck; weak fine subangular blocky structure; many very fine roots; friable; very slightly effervescent; slightly alkaline; gradual smooth boundary.

Oa2—6 to 17 inches; black (N 2.5/) muck; weak fine subangular blocky structure; friable; many very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

2Ak—17 to 32 inches; about 60 percent very dark gray (10YR 3/1) and 40 percent black (10YR 2/1) mucky silt loam; friable; common fine distinct gray (10YR 6/1) irregular carbonate masses; violently effervescent; slightly alkaline; gradual smooth boundary.

2ACk—32 to 37 inches; very dark gray (2.5Y 3/1) silt loam; weak fine subangular blocky structure; friable; common fine distinct gray (10YR 6/1) irregular carbonate masses; violently effervescent; slightly alkaline; gradual smooth boundary.

2Cg1—37 to 66 inches; about 90 percent greenish gray (5GY 5/1) and 10 percent dark greenish gray (5GY 4/1) silt loam; massive; friable; common fine distinct gray (10YR 6/1) irregular carbonate masses; violently effervescent; moderately alkaline; gradual smooth boundary.

2Cg2—66 to 80 inches; about 70 percent dark greenish gray (5GY 4/1) and 30 percent greenish gray (5GY 5/1) silt loam; massive; friable; common fine distinct

gray (10YR 6/1) irregular carbonate masses; violently effervescent; moderately alkaline.

Range in Characteristics

Thickness of the organic material: 16 to 50 inches

O horizon:
Hue—5YR, 10YR, or N
Value—2 or 3
Chroma—0 to 2
Texture—muck
Reaction—moderately acid to slightly alkaline

2A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—2 or 3
Chroma—0 or 1
Texture—loam, silt loam, sandy clay loam, silty clay loam, or clay loam or the mucky analogs of these textures
Reaction—moderately acid to slightly alkaline

2Cg horizon:
Hue—10YR, 2.5Y, 5Y, 5GY, or N
Value—2 to 7
Chroma—0 to 2
Texture—loam, silt loam, silty clay loam, clay loam, sandy clay loam, sandy loam, or fine sandy loam or the gravelly analogs of these textures
Reaction—slightly acid to moderately alkaline

Lacrescent Series

Typical Pedon

Lacrescent cobbly silty clay loam, on a southeast-facing, convex slope of 55 percent, in a mixed hardwood forest; Houston County Minnesota; about 5 miles south and 1 3/4 miles east of the town of Houston; about 820 feet west and 80 feet north of the southeast corner of sec. 27, T. 103 N., R. 6 W.; USGS Sheldon topographic quadrangle; lat. 43 degrees 41 minutes 21 seconds N. and long. 91 degrees 32 minutes 06 seconds W., NAD 83:

A—0 to 10 inches; black (10YR 2/1) cobbly silty clay loam, dark gray (10YR 4/1) dry; moderate fine and very fine subangular blocky structure; very friable; common very fine to medium tree roots; about 20 percent cobblestones and pebbles; neutral; clear smooth boundary.

AB—10 to 17 inches; very dark grayish brown (10YR 3/2) cobbly silt loam, grayish brown (10YR 5/2) dry; few small masses of black (10YR 2/1) and brown (10YR 4/3) material; moderate fine subangular blocky structure; very friable; common very fine to medium tree roots; about 25 percent cobblestones and pebbles; neutral; clear wavy boundary.

Bw—17 to 28 inches; brown (10YR 4/3) very cobbly silt loam; few small masses of very dark grayish brown (10YR 3/2) material; weak fine subangular blocky structure; very friable; few fine and medium tree roots; about 50 percent cobblestones and pebbles; neutral; clear smooth boundary.

C—28 to 60 inches; light olive brown (2.5Y 5/4) very cobbly silt loam; massive; very friable; few fine and medium tree roots in the upper part; about 60 percent cobblestones and pebbles; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: 20 to 36 inches

A or AB horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 to 3
- Texture—loam, silt loam, or silty clay loam or the cobbly, channery, flaggy, or very flaggy analogs of these textures
- Content of rock fragments—0 to 35 percent, mostly dolomite or limestone cobblestones, channers, gravel, or flagstones
- Reaction—slightly acid or neutral

Bw horizon:
- Hue—10YR
- Value—4
- Chroma—3 or 4
- Texture—the cobbly, very cobbly, extremely cobbly, channery, very channery, extremely channery, flaggy, very flaggy, or extremely flaggy analogs of loam, fine sandy loam, sandy loam, or silt loam
- Content of rock fragments—35 to 70 percent, mostly dolomite or limestone cobblestones, channers, gravel, or flagstones
- Reaction—slightly acid or neutral

C horizon:
- Hue—10YR or 2.5Y
- Value—4 or 5
- Chroma—3 or 4
- Texture—the cobbly, very cobbly, extremely cobbly, channery, very channery, extremely channery, flaggy, very flaggy, or extremely flaggy analogs of loam, fine sandy loam, or silt loam
- Content of rock fragments—35 to 70 percent, mostly dolomite or limestone cobblestones, channers, gravel, or flagstones
- Reaction—slightly alkaline or moderately alkaline

Lamont Series

Typical Pedon

Lamont fine sandy loam, 2 to 9 percent slopes, in a cultivated field; Cedar County, Iowa; about 2,410 feet north and 1,900 feet east of the southwest corner of sec. 7, T. 81 N., R. 4 W.; USGS Cedar Bluff (IA) topographic quadrangle; lat. 41 degrees 50 minutes 14.9 seconds N. and long. 91 degrees 21 minutes 33 seconds W., NAD 83:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; common fine roots; few fine dendritic tubular pores; moderately acid; abrupt smooth boundary.

E—8 to 12 inches; brown (10YR 4/3) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate thin platy structure; friable; common fine roots; few fine dendritic tubular pores; strongly acid; clear smooth boundary.

BE—12 to 19 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable; common fine roots; few fine dendritic tubular pores; moderately acid; clear smooth boundary.

Bt—19 to 32 inches; dark yellowish brown (10YR 4/4) sandy clay loam; moderate fine subangular blocky structure; friable; common fine roots; few fine dendritic tubular pores; few distinct dark brown (10YR 3/3) clay films on vertical faces of peds; moderately acid; gradual smooth boundary.

E—32 to 40 inches; yellowish brown (10YR 5/6) sandy loam; weak coarse subangular blocky structure; friable; moderately acid; abrupt smooth boundary.

E and Bt—40 to 80 inches; brownish yellow (10YR 6/6) loamy fine sand (E); single grain; loose; few yellowish brown (10YR 4/4) sandy loam lamellae (Bt) 1/2 to 1 inch thick at depths of 42, 54, 59, 62, and 67 inches; moderately acid.

Range in Characteristics

Depth to carbonates: More than 60 inches

A or Ap horizon:
- Hue—10YR
- Value—3 in uneroded areas; 3 or 4 in cultivated areas
- Chroma—1 or 2 in uneroded areas; 2 or 3 in cultivated areas
- Texture—fine sandy loam, sandy loam, or loam
- Reaction—strongly acid to neutral

E horizon:
- Hue—10YR
- Value—4 or 5
- Chroma—2 or 3
- Texture—fine sandy loam or sandy loam
- Reaction—strongly acid to neutral

BE horizon (where present):
- Hue—7.5YR or 10YR
- Value—4 to 6
- Chroma—3 to 6
- Texture—fine sandy loam or sandy loam
- Reaction—strongly acid to neutral

Bt horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6
- Chroma—3 to 6
- Texture—fine sandy loam, sandy loam, loam, or sandy clay loam
- Reaction—strongly acid to slightly acid

BC or C horizon (where present):
- Hue—7.5YR or 10YR
- Value—4 to 6
- Chroma—4 to 6
- Texture—fine sandy loam or sandy loam
- Reaction—strongly acid to slightly acid

E and Bt horizon (E part):
- Hue—7.5YR or 10YR
- Value—4 to 6
- Chroma—4 to 6
- Texture—fine sandy loam, loamy fine sand, loamy sand, fine sand, or sand
- Reaction—strongly acid to neutral

E and Bt horizon (Bt part):
- Hue—7.5YR or 10YR

Value—3 or 4
Chroma—3 or 4
Texture—sandy loam or loamy sand
Reaction—strongly acid to neutral
Thickness of lamellae—0.25 inch to 2 inches; total thickness of less than 6 inches

Lawler Series

Typical Pedon

Lawler loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field; Bremer County, Iowa; about 1,650 feet south and 100 feet east of the northwest corner of sec. 4, T. 91 N., R. 13 W.; USGS Waverly (IA) topographic quadrangle; lat. 42 degrees 43 minutes 38.6 seconds N. and long. 92 degrees 22 minutes 37.1 seconds W., NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure parting to weak fine granular; friable; moderately acid; clear smooth boundary.
A—8 to 15 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; moderately acid; gradual smooth boundary.
AB—15 to 21 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; very dark gray (10YR 3/1) organic stains on all faces of peds; moderately acid; gradual smooth boundary.
Bg1—21 to 27 inches; dark grayish brown (2.5Y 4/2) loam; weak medium subangular blocky structure; friable; very dark grayish brown (2.5Y 3/2) organic stains on all faces of peds; few fine prominent yellowish red (5YR 4/6), common fine prominent yellowish brown (10YR 5/6), and common fine distinct olive brown (2.5Y 4/4) masses of oxidized iron; moderately acid; gradual smooth boundary.
Bg2—27 to 32 inches; dark grayish brown (2.5Y 4/2), grayish brown (2.5Y 5/2), and yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; friable; few fine prominent light olive brown (2.5Y 5/6) and brown (7.5YR 4/4) masses of oxidized iron; slightly acid; clear wavy boundary.
BC—32 to 37 inches; yellowish brown (10YR 5/6), light olive brown (2.5Y 5/6), and grayish brown (2.5Y 5/2) sandy clay loam; weak coarse subangular blocky structure; friable; slightly acid; clear smooth boundary.
2C1—37 to 45 inches; dark grayish brown (10YR 4/2) very gravelly loamy sand; single grain; loose; about 40 percent subrounded mixed rock fragments; slightly acid; clear smooth boundary.
2C2—45 to 57 inches; brown (10YR 4/3) very gravelly loamy sand; single grain; loose; about 40 percent subrounded mixed rock fragments; slightly acid; clear wavy boundary.
2C3—57 to 80 inches; brown (10YR 4/3) coarse sand; single grain; loose; slightly acid.

Range in Characteristics

Depth to sand and gravel: 24 to 40 inches
Depth to carbonates: More than 48 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2

Texture—loam, silt loam, or clay loam
Reaction—moderately acid to neutral

AB or BA horizon:
Hue—10YR
Value—3
Chroma—1 or 2
Texture—loam or clay loam
Note—in some pedons, value of 3 on faces of peds extends to a depth of 24 inches or more

Bg, Bw, or BC horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—2 to 6
Texture—loam, clay loam, sandy clay loam, or silt loam
Reaction—strongly acid to slightly acid

2BC horizon (where present):
Hue—7.5YR to 2.5Y
Value—4 to 8
Chroma—1 to 6
Texture—loamy coarse sand to gravelly loamy sand; thin layers of sandy loam in some pedons
Reaction—strongly acid to neutral

2C horizon:
Hue—7.5YR to 2.5Y
Value—4 to 8
Chroma—1 to 6
Texture—loamy coarse sand, loamy sand, coarse sand, or sand or the gravelly or very gravelly analogs of these textures
Content of gravel—0 to 50 percent
Reaction—strongly acid to neutral

Lindley Series

Typical Pedon

Lindley loam, 18 to 25 percent slopes, moderately eroded, in a pasture; Cedar County, Iowa; about 300 feet east and 700 feet south of the northwest corner of sec. 21, T. 81 N., R. 1 W.; USGS Lowden (IA) topographic quadrangle; lat. 41 degrees 48 minutes 49.7 seconds N. and long. 90 degrees 58 minutes 28.4 seconds W., NAD 83:

A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure parting to moderate fine granular; friable; many fine and medium roots; common fine dendritic tubular pores; strongly acid; abrupt smooth boundary.

BE—5 to 7 inches; dark yellowish brown (10YR 4/4) and brown (10YR 4/3) loam; moderate medium platy structure parting to moderate fine subangular blocky; friable; common medium roots; common fine dendritic tubular pores; few distinct very dark grayish brown (10YR 3/2) organoargillans on all faces of peds; very strongly acid; clear smooth boundary.

Bt1—7 to 17 inches; dark yellowish brown (10YR 4/4) clay loam; moderate fine subangular blocky structure; firm; few medium roots; few fine dendritic tubular

pores; common distinct brown (10YR 4/3) clay films on all faces of peds; very strongly acid; gradual smooth boundary.

Bt2—17 to 27 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; few medium roots; common distinct yellowish brown (10YR 5/4) clay films on all faces of peds; very strongly acid; gradual smooth boundary.

Bt3—27 to 40 inches; yellowish brown (10YR 5/6) clay loam; moderate coarse subangular blocky structure; firm; common distinct yellowish brown (10YR 5/4) clay films on all faces of peds; few fine prominent black (7.5YR 2/1) irregular iron-manganese masses; few fine distinct pale brown (10YR 6/3) irregular iron depletions; about 1 percent subrounded gravel; strongly acid; gradual smooth boundary.

Bt4—40 to 55 inches; yellowish brown (10YR 5/6) clay loam; moderate medium prismatic structure; firm; common distinct brown (10YR 4/3) clay films on all faces of peds; common fine prominent black (7.5YR 2/1) irregular iron-manganese masses; common fine faint strong brown (7.5YR 4/6) irregular masses of oxidized iron; many medium distinct pale brown (10YR 6/3) irregular iron depletions on surfaces along root channels; about 1 percent subrounded gravel; very slightly effervescent; moderately alkaline; clear smooth boundary.

BC—55 to 80 inches; yellowish brown (10YR 5/6) clay loam; moderate medium prismatic structure; firm; common prominent very pale brown (10YR 8/2) carbonate coatings on vertical faces of peds; common fine prominent dark brown (7.5YR 3/2) irregular masses of oxidized iron; about 2 percent subrounded gravel; moderately alkaline; violently effervescent.

Range in Characteristics

Depth to carbonates: More than 40 inches

A horizon:
- Hue—10YR
- Value—3 or 4
- Chroma—1 or 2
- Texture—loam, silt loam, or clay loam
- Reaction—very strongly acid to neutral

Ap horizon:
- Hue—10YR
- Value—4 or 5
- Chroma—2 to 5
- Texture—loam, silt loam, or clay loam
- Reaction—very strongly acid to neutral

E or BE horizon (where present):
- Hue—10YR
- Value—4 to 6
- Chroma—2 to 4
- Texture—loam, silt loam, clay loam, or fine sandy loam
- Reaction—very strongly acid to neutral

Bt horizon:
- Hue—7.5YR or 10YR
- Value—4 or 5
- Chroma—4 to 6
- Texture—clay loam or loam
- Reaction—very strongly acid to moderately alkaline

BC or C horizon (where present):
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—1 to 6
Texture—loam or clay loam
Reaction—slightly acid to moderately alkaline

Maxfield Series

Typical Pedon

Maxfield silty clay loam, 0 to 2 percent slopes, in a cultivated field; Cedar County, Iowa; about 15 feet north and 70 feet east of the southwest corner of sec. 18, T. 82 N., R. 2 W.; USGS Stanwood (IA) topographic quadrangle; lat. 41 degrees 54 minutes 12.2 seconds N. and long. 91 degrees 07 minutes 45.9 seconds W., NAD 83:

Ap—0 to 6 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common fine roots; common fine dendritic tubular pores; neutral; clear smooth boundary.

A1—6 to 12 inches; black (N 2/) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; common fine roots; common fine dendritic tubular pores; neutral; abrupt smooth boundary.

A2—12 to 19 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; few fine roots; few fine dendritic tubular pores; neutral; clear smooth boundary.

Bg1—19 to 28 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; few distinct very dark gray (10YR 3/1) organic stains on all faces of peds; few fine prominent yellowish brown (10YR 5/6) masses of oxidized iron; neutral; clear smooth boundary.

Bg2—28 to 39 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; friable; few fine roots; few fine dendritic tubular pores; few distinct very dark gray (10YR 3/1) organic stains on all faces of peds; many coarse prominent yellowish brown (10YR 5/6) masses of oxidized iron; neutral; abrupt smooth boundary.

2BC1—39 to 51 inches; about 50 percent yellowish brown (10YR 5/6) and 50 percent light brownish gray (2.5Y 6/2) loam; weak medium prismatic structure; firm; few fine prominent black (10YR 2/1) manganese masses; neutral; clear smooth boundary.

2BC2—51 to 59 inches; about 80 percent light brownish gray (2.5Y 6/2) and 20 percent yellowish brown (10YR 5/6) loam; weak coarse subangular blocky structure; friable; common fine prominent black (10YR 2/1) manganese masses; neutral; gradual smooth boundary.

2C—59 to 80 inches; light olive brown (2.5Y 5/4) loam; massive; friable; common fine prominent black (10YR 2/1) manganese masses; many coarse distinct light brownish gray (2.5Y 6/2) iron depletions; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 14 to 24 inches
Depth to till: 24 to 40 inches
Depth to carbonates: 40 to 60 inches

Ap or A horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam or silt loam
Reaction—strongly acid to neutral

Bg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay loam or silt loam
Reaction—moderately acid to neutral

2BC or 2C horizon:
Hue—7.5YR to 5Y
Value—4 to 6
Chroma—1 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline

Maxmore Series

Typical Pedon

Maxmore silty clay loam, 0 to 2 percent slopes, in a cultivated field; Cedar County, Iowa; about 985 feet north and 2,230 feet east of the southwest corner of sec. 14, T. 82 N., R. 3 W.; USGS Stanwood (IA) topographic quadrangle; lat. 41 degrees 54 minutes 20.8 seconds N. and long. 91 degrees 09 minutes 50.4 seconds W., NAD 83:

Ap—0 to 7 inches; black (N 2/) silty clay loam, black (10YR 2/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common fine roots; common fine dendritic tubular pores; neutral; gradual smooth boundary.
A1—7 to 14 inches; black (N 2/) silty clay loam, black (10YR 2/1) dry; weak fine subangular blocky structure; friable; common fine roots; common fine dendritic tubular pores; neutral; gradual smooth boundary.
A2—14 to 22 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; few fine roots; few very fine dendritic tubular pores; neutral; gradual smooth boundary.
Btg1—22 to 29 inches; dark gray (2.5Y 4/1) silty clay loam; moderate fine prismatic structure parting to moderate medium subangular blocky; friable; few very fine dendritic tubular pores; few distinct black (2.5Y 2.5/1) clay films on vertical faces of peds; neutral; gradual smooth boundary.
Btg2—29 to 40 inches; olive gray (5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate coarse subangular blocky; friable; few very fine dendritic tubular pores; many distinct olive (5Y 5/3) clay films on vertical faces of peds; common medium prominent dark yellowish brown (10YR 4/6) irregular masses of oxidized iron on faces of peds; neutral; gradual smooth boundary.
Btg3—40 to 50 inches; olive gray (5Y 5/2) silty clay loam; weak medium subangular blocky structure; friable; few very fine dendritic tubular pores; few distinct very dark gray (2.5Y 3/1) organic stains on surfaces along pores; common medium prominent dark yellowish brown (10YR 4/6) irregular masses of oxidized iron on faces of peds; neutral; gradual smooth boundary.
Btg4—50 to 58 inches; gray (5Y 5/1) silty clay loam; weak medium subangular blocky structure; friable; common fine distinct black (2.5Y 2.5/1) spherical manganese

masses in the matrix; many medium prominent dark yellowish brown (10YR 4/6) irregular masses of oxidized iron on faces of peds; neutral; abrupt smooth boundary.

2C1—58 to 63 inches; about 60 percent light yellowish brown (2.5Y 6/3) and 40 percent yellowish brown (10YR 5/6) loamy fine sand; single grain; loose; about 10 percent gravel; neutral; abrupt smooth boundary.

2C2—63 to 80 inches; about 70 percent dark yellowish brown (10YR 4/4) and 30 percent gray (2.5Y 6/1) loam; massive; friable; about 3 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 14 to 24 inches
Depth to till: 40 to 60 inches
Depth to carbonates: More than 40 inches
Other features: Some pedons have a stone line or a thin layer (1 to 5 inches thick) of gravelly and sandy materials at the base of the silty or loamy sediments.

Ap or A horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 to 2
Texture—silty clay loam or silt loam
Reaction—strongly acid to neutral

Btg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay loam
Reaction—strongly acid to neutral
Other features—stone line common at the lower boundary

2BC or 2C horizon:
Hue—7.5YR to 5Y
Value—4 to 6
Chroma—1 to 8
Texture—loam or loamy fine sand
Reaction—slightly acid to moderately alkaline

Mt. Carroll Series

Typical Pedon

Mt. Carroll silt loam, 5 to 9 percent slopes, moderately eroded, in a cultivated field; Cedar County, Iowa; about 66 feet west and 1,034 feet south of the northeast corner of sec. 18, T. 82 N., R. 3 W.; USGS Stanwood (IA) topographic quadrangle; lat. 41 degrees 54 minutes 53.9 seconds N. and long. 91 degrees 13 minutes 47.8 seconds W., NAD 83:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate medium and fine granular structure; friable; few fine roots; few fine dendritic tubular pores; slightly acid; abrupt smooth boundary.

BE—8 to 14 inches; brown (10YR 4/3) silt loam; weak medium platy structure parting to moderate fine granular; friable; few fine roots; few fine dendritic tubular pores;

few distinct dark brown (10YR 3/3) organic stains on all faces of peds; moderately acid; clear smooth boundary.

Bt1—14 to 22 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; few distinct brown (10YR 5/3) clay films on all faces of peds; moderately acid; gradual smooth boundary.

Bt2—22 to 32 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; few distinct brown (10YR 4/3) clay films on all faces of peds; few prominent very pale brown (10YR 7/3) (dry) silt coatings on all faces of peds; moderately acid; gradual smooth boundary.

Bt3—32 to 47 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; few distinct dark yellowish brown (10YR 4/4) clay films on all faces of peds; few prominent very pale brown (10YR 7/3) (dry) silt coatings on all faces of peds; moderately acid; gradual smooth boundary.

BC—47 to 64 inches; yellowish brown (10YR 5/4 and 5/6) silt loam; weak coarse subangular blocky structure; friable; few fine dendritic tubular pores; few prominent light gray (10YR 7/2) (dry) silt coatings on all faces of peds; few fine distinct strong brown (7.5YR 4/6) (moist) irregular sharp iron-manganese nodules; moderately acid; gradual smooth boundary.

C—64 to 80 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; slightly acid.

Range in Characteristics

Thickness of the loess: More than 80 inches
Depth to carbonates: More than 45 inches

Ap or A horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 to 3
- Texture—silt loam
- Reaction—moderately acid to neutral

E horizon (where present):
- Hue—10YR
- Value—4 to 6
- Chroma—3 to 6
- Texture—silt loam
- Reaction—moderately acid to neutral

BE and Bt horizons:
- Hue—7.5YR or 10YR
- Value—4 or 5
- Chroma—3 to 6
- Texture—silt loam
- Reaction—strongly acid to neutral

BC and C horizons:
- Hue—7.5YR, 10YR, or 2.5Y
- Value—5 or 6
- Chroma—1 to 8
- Texture—silt loam
- Reaction—moderately acid to moderately alkaline

Taxadjunct features: The representative pedons for the severely eroded Mt. Carroll soils in map units 662C2, 662D2, 662D3, and 662E3 are taxadjuncts because the surface layer does not meet the requirements for the Mollic subgroup. These pedons are classified as fine-silty, mixed, superactive, mesic Typic Hapludalfs.

Muscatine Series

Typical Pedon

Muscatine silty clay loam, 0 to 2 percent slopes, in a cultivated field; Cedar County, Iowa; about 110 feet east and 1,290 feet south of the northwest corner of sec. 5, T. 80 N., R. 1 W.; USGS Lowden (IA) topographic quadrangle; lat. 41 degrees 46 minutes 05.5 seconds N. and long. 90 degrees 59 minutes 38.7 seconds W., NAD 83:

Ap—0 to 7 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; few fine roots; few fine dendritic tubular pores; strongly acid; abrupt smooth boundary.

A1—7 to 10 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; moderately acid; clear smooth boundary.

A2—10 to 17 inches; very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) dry; moderate fine subangular blocky structure parting to moderate medium granular; friable; few fine roots; few very fine tubular pores; moderately acid; gradual smooth boundary.

AB—17 to 22 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; friable; few distinct very dark gray (10YR 3/1) organic stains on surfaces along pores; moderately acid; clear smooth boundary.

Btg1—22 to 30 inches; dark grayish brown (10YR 4/2) silty clay loam; moderate medium subangular blocky structure; friable; common distinct grayish brown (10YR 5/2) clay films on all faces of peds; few distinct very dark gray (10YR 3/1) organic stains on surfaces along pores; moderately acid; gradual smooth boundary.

Btg2—30 to 39 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate medium subangular blocky structure; friable; common distinct light olive brown (2.5Y 5/3) clay films on all faces of peds; few distinct very dark gray (10YR 3/1) organic stains on surfaces along pores; common fine prominent yellowish brown (10YR 5/6) masses of oxidized iron; gradual smooth boundary.

Btg3—39 to 48 inches; light olive brown (2.5Y 5/3) silty clay loam; weak medium subangular blocky structure; friable; few distinct dark grayish brown (2.5Y 4/2) clay films on all faces of peds; common fine prominent black (10YR 2/1) iron-manganese masses; common medium prominent dark yellowish brown (10YR 4/6) masses of oxidized iron; moderately acid; gradual smooth boundary.

BCg1—48 to 56 inches; olive gray (5Y 5/2) silty clay loam; weak fine prismatic structure parting to weak medium subangular blocky; friable; common fine prominent black (10YR 2/1) iron-manganese masses; common coarse prominent dark yellowish brown (10YR 4/6) masses of oxidized iron; neutral; gradual smooth boundary.

BCg2—56 to 65 inches; olive gray (5Y 5/2) silt loam; weak medium prismatic structure; friable; common medium prominent black (10YR 2/1) iron-manganese masses; many medium prominent dark yellowish brown (10YR 4/6) masses of oxidized iron; neutral; gradual smooth boundary.

Cg—65 to 80 inches; olive gray (5Y 5/2) silt loam; massive; friable; common medium prominent black (10YR 2/1) iron-manganese masses; many medium prominent yellowish brown (10YR 5/6) masses of oxidized iron; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 14 to 24 inches
Depth to carbonates: More than 48 inches
Depth to till: More than 60 inches

Ap or A horizon:
Hue—10YR
Value—2
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—strongly acid to neutral

AB or BA horizon:
Hue—10YR
Value—3
Chroma—1 or 2
Texture—silty clay loam
Reaction—strongly acid to neutral

Btg horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—silty clay loam
Reaction—strongly acid to neutral

BCg and Cg horizons:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—2 to 4
Texture—silty clay loam or silt loam
Reaction—moderately acid to slightly alkaline

Nevin Series

Typical Pedon

Nevin silty clay loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field; Cedar County, Iowa; about 140 feet south and 2,000 feet west of the northeast corner of sec. 35, T. 79 N., R. 4 W.; USGS West Liberty (IA) topographic quadrangle; lat. 41 degrees 36 minutes 44.4 seconds N. and long. 91 degrees 16 minutes 33.5 seconds W., NAD 83:

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; slightly acid; gradual wavy boundary.
A1—9 to 19 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; friable; slightly acid; gradual wavy boundary.

A2—19 to 24 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; friable; slightly acid; gradual smooth boundary.
BA—24 to 34 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate medium subangular blocky structure; common very dark gray (10YR 3/1) organic stains on all faces of peds; friable; slightly acid; gradual smooth boundary.
Btg1—34 to 41 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate medium subangular blocky structure; friable; few very dark gray (2.5Y 3/1) organoargillans on faces of peds; slightly acid; clear smooth boundary.
Btg2—41 to 56 inches; grayish brown (2.5Y 5/2) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; very few very dark gray (2.5Y 3/1) organoargillans on faces of peds; few fine and medium prominent strong brown (7.5YR 4/6) and black (7.5YR 2/1) iron-manganese masses; slightly acid; gradual smooth boundary.
BCg—56 to 67 inches; grayish brown (2.5Y 5/2) silty clay loam; strong medium subangular blocky structure; friable; common medium and coarse prominent black (7.5YR 2/1) iron-manganese concretions; common medium and coarse strong brown (7.5YR 4/6) iron-manganese masses; slightly acid; clear smooth boundary.
Cg—67 to 80 inches; grayish brown (2.5Y 5/2) silty clay loam; massive; friable; few fine prominent black (7.5YR 2/1) iron-manganese concretions; common fine and medium prominent strong brown (7.5YR 4/6) iron oxide masses; slightly acid.

Range in Characteristics

Depth to carbonates: More than 60 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

BA and Btg horizons:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silty clay loam
Reaction—moderately acid to neutral

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 to 4
Texture—silty clay loam or silt loam
Reaction—slightly acid to slightly alkaline

2C horizon (where present):
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 to 4
Texture—loamy sand, sandy loam, or sand or the gravelly analogs of these textures
Reaction—slightly acid to slightly alkaline

Nodaway Series

Typical Pedon

Nodaway silt loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; Cedar County, Iowa; about 295 feet east and 1,526 feet south of the northwest corner of sec. 11, T. 80 N., R. 4 W.; USGS Cedar Bluff (IA) topographic quadrangle; lat. 41 degrees 45 minutes 13.1 seconds N. and long. 91 degrees 17 minutes 14.1 seconds W., NAD 83:

Ap—0 to 9 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; few fine roots; few fine dendritic tubular pores; neutral; abrupt smooth boundary.

C1—9 to 35 inches; about 40 percent dark grayish brown (10YR 4/2), 40 percent very dark grayish brown (10YR 3/2), and 20 percent grayish brown (10YR 5/2) silt loam; massive with weak thin alluvial stratification; friable; few fine dendritic tubular pores; band of black (N 2/) charcoal about 2 inches thick; neutral; clear smooth boundary.

C2—35 to 55 inches; about 70 percent grayish brown (10YR 5/2) and 30 percent dark grayish brown (10YR 4/2) silt loam; massive with weak thin alluvial stratification; friable; few fine dendritic tubular pores; common fine prominent dark yellowish brown (10YR 4/6) irregular masses of oxidized iron; neutral; gradual smooth boundary.

C3—55 to 80 inches; about 90 percent dark grayish brown (10YR 4/2) and 10 percent grayish brown (10YR 5/2) silt loam; massive with weak thin alluvial stratification; friable; few fine dendritic tubular pores; neutral.

Range in Characteristics

Depth to buried horizons: More than 40 inches
Depth to carbonates: More than 60 inches
Other features: Some pedons have very thin lenses of material coarser than silt loam within a depth of 40 inches. Some pedons are sandy below a depth of 60 inches.

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—slightly acid or neutral

C horizon:
Hue—10YR
Value—2 to 5
Chroma—1 or 2
Texture—silt loam or silty clay loam or stratified with these textures
Reaction—slightly acid or neutral

Ab horizon (where present):
Hue—10YR or N
Value—2 or 3
Chroma—0 to 2
Texture—silty clay loam or silt loam
Reaction—slightly acid or neutral

Bb horizon (where present):
Hue—10YR

Value—3
Chroma—2
Texture—silty clay loam or silt loam
Reaction—slightly acid or neutral

Osco Series

Typical Pedon

Osco silt loam, on a south-facing slope of 3 percent in a cultivated field; Carroll County, Illinois; about 3.5 miles east and 3.25 miles south of Lanark; 88 feet west and 316 feet north of the southeast corner of sec. 23, T. 24 N., R. 6 E.; USGS Lanark topographic quadrangle; lat. 42 degrees 03 minutes 13.4 seconds N. and long. 89 degrees 45 minutes 48.2 seconds W., NAD 27:

Ap—0 to 10 inches; very dark brown (10YR 2/2) and black (10YR 2/1) silt loam, very dark grayish brown (10YR 3/2) dry; moderate fine granular structure; friable; slightly acid; clear smooth boundary.

A—10 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium and coarse granular structure; friable; strongly acid; clear smooth boundary.

BA—14 to 20 inches; dark yellowish brown (10YR 3/4) and dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; many roots; few distinct light brownish gray (10YR 6/2) (dry) silt coatings (clay depletions) on faces of peds; common earthworm casts and holes; strongly acid; clear smooth boundary.

Bt1—20 to 26 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; common faint dark brown (10YR 3/3) clay films; few distinct gray (10YR 6/1) (dry) silt coatings (clay depletions) on faces of peds; strongly acid; clear smooth boundary.

Bt2—26 to 37 inches; dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; many faint dark yellowish brown (10YR 4/4) clay films; common distinct light brownish gray (10YR 6/2) (dry) silt coatings (clay depletions) on faces of peds; many very dark gray (N 3/) and dark brown (7.5YR 3/2) redoximorphic concretions (iron and manganese oxides); common fine faint brown (10YR 5/3) and common medium prominent strong brown (7.5YR 5/8) redoximorphic concentrations; strongly acid; clear smooth boundary.

Bt3—37 to 45 inches; light yellowish brown (10YR 6/4) silty clay loam; moderate coarse subangular blocky structure; friable; many faint dark yellowish brown (10YR 4/4) clay films on faces of peds; many prominent dark brown (7.5YR 3/2) redoximorphic concretions (iron and manganese oxides); common fine distinct light brownish gray (10YR 6/2) redoximorphic depletions; few medium prominent strong brown (7.5YR 5/8) redoximorphic concentrations; strongly acid; gradual smooth boundary.

BC—45 to 55 inches; yellowish brown (10YR 5/4) and brown (10YR 4/3) silty clay loam; weak coarse angular blocky structure; friable; few fine distinct light brownish gray (10YR 6/2) redoximorphic depletions; strongly acid; gradual smooth boundary.

C—55 to 60 inches; yellowish brown (10YR 5/4 and 5/6) and brown (10YR 4/3) silt loam; massive with some vertical partings; friable; many fine distinct grayish brown (10YR 5/2) redoximorphic depletions; moderately acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 18 inches
Depth to carbonates: More than 48 inches

A or Ap horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 or 2
- Texture—silt loam or silty clay loam
- Reaction—strongly acid to slightly acid

Bt horizon:
- Hue—10YR
- Value—4 to 6
- Chroma—3 or 4
- Texture—silty clay loam; subhorizons of silt loam in the upper or lower part in some pedons
- Reaction—strongly acid or moderately acid

BC, C, or Cg horizon:
- Hue—10YR; 2.5Y below a depth of 40 inches in some pedons
- Value—4 or 5
- Chroma—2 to 6
- Texture—silt loam or silty clay loam
- Reaction—strongly acid to neutral

Taxadjunct features: The representative pedon for the moderately eroded Osco soil in map unit 120C2 is a taxadjunct because the surface layer does not meet the thickness requirements for a Mollisol. This pedon is classified as a fine-silty, mixed, superactive, mesic Mollic Hapludalf.

Ossian Series

Typical Pedon

Ossian silt loam, on a slope of about 1 percent, in a cultivated field on a flood plain; Winneshiek County, Iowa; about 1 mile east of Ossian; about 1,630 feet south and 1,306 feet west of the northeast corner of sec. 12, T. 96 N., R. 8 W.; USGS Postville NW (IA) topographic quadrangle; lat. 43 degrees 08 minutes 59.4 seconds N. and long. 91 degrees 43 minutes 44.6 seconds W., NAD 83:

Ap—0 to 9 inches; black (N 2/) silt loam, very dark gray (10YR 3/1) dry; moderate very fine and fine granular structure; friable; common very fine and fine tubular pores; neutral; abrupt smooth boundary.

A—9 to 15 inches; black (N 2/) silt loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; common very fine and fine tubular pores; neutral; clear wavy boundary.

AB—15 to 23 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure; friable; common very fine and fine tubular pores; common distinct black (N 2/) organic coatings on faces of peds and on surfaces along pores; neutral; clear wavy boundary.

Bg1—23 to 32 inches; grayish brown (2.5Y 5/2) silt loam; moderate fine subangular blocky structure; friable; common very fine and fine tubular pores; common distinct dark gray (2.5Y 4/1) organic coatings on faces of peds and on surfaces along pores; common fine and very fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; neutral; gradual wavy boundary.

Bg2—32 to 41 inches; light olive gray (5Y 6/2) silt loam; weak fine prismatic structure parting to weak fine subangular blocky; friable; common very fine tubular pores; few distinct olive gray (5Y 5/2) coatings on faces of peds and on surfaces along pores; common fine dark reddish brown (5YR 3/4) masses of iron-manganese; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; neutral; gradual wavy boundary.

Bg3—41 to 66 inches; light olive gray (5Y 6/2) silt loam; weak medium prismatic structure parting to weak fine and medium subangular blocky; friable; common very fine tubular pores; few distinct olive gray (5Y 5/2) coatings on faces of peds and on surfaces along pores; common fine dark reddish brown (5YR 3/4) masses of iron-manganese; common fine and medium prominent strong brown (7.5YR 5/8) redoximorphic concentrations; neutral; gradual wavy boundary.

BCg—66 to 80 inches; light olive gray (5Y 6/2) silt loam; weak coarse prismatic structure; friable; common very fine tubular pores; few fine dark reddish brown (5YR 3/4) masses of iron-manganese; common fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 24 inches
Depth to carbonates: More than 40 inches

A or Ap horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—2
Chroma—0 or 1
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

AB or BA horizon (where present):
Hue—10YR or 2.5Y
Value—2 to 5
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

Bg horizon:
Hue—2.5Y, 5Y, or N
Value—4 to 6
Chroma—0 to 2
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

BCg horizon and Cg horizon (where present):
Hue—2.5Y, 5Y, or N
Value—4 to 6
Chroma—0 to 2
Texture—silt loam
Reaction—slightly acid to slightly alkaline

Perks Series

Typical Pedon

Perks loamy sand, in an area of Perks-Spillville complex, 0 to 2 percent slopes, channeled, frequently flooded, in a wooded area; Cedar County, Iowa; about 1,440

feet west and 2,165 feet south of the northeast corner of sec. 3, T. 79 N., R. 3 W.; USGS Rochester (IA) topographic quadrangle; lat. 41 degrees 40 minutes 44.2 seconds N. and long. 91 degrees 10 minutes 37.6 seconds W., NAD 83:

A—0 to 5 inches; very dark gray (10YR 3/1) loamy sand, gray (10YR 5/1) dry; weak fine granular structure; very friable; few very fine roots; moderately acid; abrupt smooth boundary.
C1—5 to 33 inches; yellowish brown (10YR 5/4) sand; single grain; loose; moderately acid; gradual smooth boundary.
C2—33 to 40 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; thin strata of dark grayish brown (10YR 4/2) silt loam; slightly acid; gradual smooth boundary.
C3—40 to 80 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; slightly acid.

Range in Characteristics

Depth to carbonates: More than 40 inches

A horizon (where present):
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sand, loamy sand, or sandy loam
Reaction—moderately acid to neutral

Ap horizon (where present):
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—sand, loamy sand, or sandy loam
Reaction—moderately acid to neutral

C horizon:
Hue—10YR
Value—4 to 6
Chroma—4 to 6
Texture—sand or loamy sand
Reaction—moderately acid to neutral

Pillot Series

Typical Pedon

Pillot silt loam, 2 to 5 percent slopes, in a cultivated field; Cedar County, Iowa; about 1,900 feet east and 1,575 feet south of the northwest corner of sec. 22, T. 81 N., R. 4 W.; USGS Cedar Bluff (IA) topographic quadrangle; lat. 41 degrees 48 minutes 43.2 seconds N. and long. 91 degrees 18 minutes 01.8 seconds W., NAD 83:

Ap—0 to 8 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; few fine roots between peds; common fine dendritic tubular pores; slightly acid; abrupt smooth boundary.
A—8 to 16 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure parting to weak fine granular; firm; few fine roots between peds; few fine dendritic tubular pores; moderately acid; clear smooth boundary.

Bt—16 to 27 inches; brown (10YR 4/3) silty clay loam; moderate medium subangular blocky structure parting to moderate fine subangular blocky; firm; few fine roots between peds; few fine dendritic tubular pores; common distinct very dark brown (10YR 2/2) organic stains on all faces of peds; moderately acid; clear smooth boundary.
2BC1—27 to 32 inches; brown (10YR 4/3) clay loam; weak medium subangular blocky structure; friable; few distinct dark grayish brown (10YR 4/2) clay films on all faces of peds; moderately acid; clear smooth boundary.
2BC2—32 to 42 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine subangular blocky structure; very friable; moderately acid; clear smooth boundary.
2C1—42 to 60 inches; about 80 percent yellowish brown (10YR 5/6) and 20 percent dark yellowish brown (10YR 4/6), stratified fine sand to sandy loam; single grain; loose; moderately acid; clear smooth boundary.
2C2—60 to 80 inches; about 70 percent yellowish brown (10YR 5/6) and 30 percent dark yellowish brown (10YR 4/6) sand; single grain; loose; moderately acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches

A or Ap horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 to 3
- Texture—silt loam or silty clay loam
- Reaction—moderately acid to neutral

Bt horizon:
- Hue—7.5YR or 10YR
- Value—3 to 5
- Chroma—3 or 4
- Texture—silty clay loam or silt loam
- Reaction—moderately acid to neutral

2BC horizon:
- Hue—7.5YR or 10YR
- Value—3 to 5
- Chroma—3 or 4
- Texture—sandy clay loam, loam, sandy loam, clay loam, fine sandy loam, loamy fine sand, or loamy sand
- Reaction—moderately acid to neutral

2C horizon:
- Hue—10YR
- Value—4 to 6
- Chroma—4 to 6
- Texture—loamy fine sand, loamy sand, or sand or stratified with these textures; strata of fine sand and sandy loam in some pedons
- Reaction—moderately acid to neutral

Radford Series

Typical Pedon

Radford silt loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; Cedar County, Iowa; about 131 feet north and 1,670 feet east of the southwest corner

of sec. 19, T. 79 N., R. 3 W.; USGS Rochester (IA) topographic quadrangle; lat. 41 degrees 37 minutes 38.8 seconds N. and long. 91 degrees 14 minutes 36.6 seconds W., NAD 83:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; few fine roots; few fine dendritic tubular pores; neutral; clear smooth boundary.

A—7 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium platy structure parting to moderate fine granular; friable; few fine roots; few fine dendritic tubular pores; common distinct very dark gray (10YR 3/1) organic stains on all faces of peds; neutral; abrupt smooth boundary.

C1—12 to 17 inches; about 60 percent very dark grayish brown (10YR 3/2) and 40 percent grayish brown (10YR 5/2) silt loam; massive with weak thin alluvial stratification; friable; few fine roots; few fine dendritic tubular pores; few fine dark yellowish brown (10YR 4/4) irregular masses of oxidized iron along surfaces of pores; neutral; clear smooth boundary.

C2—17 to 28 inches; about 80 percent very dark grayish brown (10YR 3/2) and 20 percent grayish brown (10YR 5/2) silt loam; massive with weak thin alluvial stratification; friable; few fine roots; few fine dendritic tubular pores; few fine dark yellowish brown (10YR 4/4) irregular masses of oxidized iron along surfaces of pores; neutral; clear smooth boundary.

C3—28 to 37 inches; about 70 percent grayish brown (10YR 5/2) and 30 percent very dark gray (10YR 3/1) silt loam; massive with weak thin alluvial stratification; friable; few fine roots; few fine dendritic tubular pores; many fine prominent dark yellowish brown (10YR 4/6) irregular masses of oxidized iron; neutral; abrupt smooth boundary.

Ab1—37 to 43 inches; black (10YR 2/1) silty clay loam; weak medium subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; common fine prominent dark yellowish brown (10YR 4/6) and dark brown (7.5YR 3/4) irregular masses of oxidized iron; slightly acid; gradual smooth boundary.

Ab2—43 to 60 inches; black (10YR 2/1) silty clay loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine prominent dark yellowish brown (10YR 4/6) irregular masses of oxidized iron; slightly acid; gradual smooth boundary.

Ab3—60 to 69 inches; black (N 2/) silty clay loam; weak medium prismatic structure; friable; common medium prominent olive gray (5Y 5/2) irregular iron depletions; common fine prominent dark yellowish brown (10YR 4/6) irregular masses of oxidized iron; slightly acid; clear smooth boundary.

Bgb—69 to 80 inches; olive gray (5Y 5/2) silty clay loam; weak medium prismatic structure; friable; few distinct grayish brown (2.5Y 5/2) organic stains on all faces of peds; common fine prominent dark yellowish brown (10YR 4/6) irregular masses of oxidized iron; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Depth to the top of the buried soil: 20 to 40 inches

Ap or A horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 or 2
- Texture—silt loam
- Reaction—moderately acid to slightly alkaline

C horizon:
Hue—10YR
Value—2 to 6
Chroma—1 or 2
Texture—silt loam
Reaction—slightly acid to slightly alkaline

Ab or ABb horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam, silt loam, clay loam, or loam
Reaction—slightly acid to slightly alkaline

Bgb horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 6
Chroma—0 to 2
Texture—silt loam, silty clay loam, clay loam, or loam
Reaction—slightly acid to slightly alkaline

Richwood Series

Typical Pedon

Richwood silt loam, 0 to 2 percent slopes, in a cultivated field; Cedar County, Iowa; about 508 feet east and 1,100 feet south of the northwest corner of sec. 33, T. 81 N., R. 4 W.; USGS Cedar Bluff (IA) topographic quadrangle; lat. 41 degrees 47 minutes 03.2 seconds N. and long. 91 degrees 19 minutes 30.8 seconds W., NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular and subangular blocky structure; friable; common fine roots; common fine dendritic tubular pores; slightly acid; abrupt smooth boundary.

A—8 to 20 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; few fine roots; few fine dendritic tubular pores; many distinct black (10YR 2/1) organic stains on all faces of peds; slightly acid; gradual smooth boundary.

BA—20 to 25 inches; about 60 percent dark yellowish brown (10YR 3/4) and 40 percent dark brown (10YR 3/3) silt loam; weak fine subangular blocky structure; friable; few fine roots; few fine dendritic tubular pores; many distinct very dark brown (10YR 2/2) organic stains on all faces of peds; slightly acid; clear smooth boundary.

Bt1—25 to 31 inches; brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; few fine dendritic tubular pores; common distinct dark brown (10YR 3/3) organoargillans on all faces of peds; moderately acid; clear smooth boundary.

Bt2—31 to 42 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; very friable; few fine dendritic tubular pores; few distinct brown (10YR 4/3) clay films on all faces of peds; moderately acid; abrupt smooth boundary.

2BC1—42 to 50 inches; dark yellowish brown (10YR 4/6), stratified fine sandy loam and loamy sand; weak coarse subangular blocky structure; very friable; moderately acid; abrupt smooth boundary.

2BC2—50 to 66 inches; yellowish brown (10YR 5/4) and dark yellowish brown (10YR 3/4), stratified fine sandy loam and loamy sand; weak coarse subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.
2C—66 to 80 inches; very pale brown (10YR 7/3) fine sand; single grain; loose; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Thickness of the silty material: 40 to 60 inches

Ap and A horizons:
Hue—10YR
Value—3 or 4
Chroma—1 to 3
Texture—silty loam
Reaction—moderately acid to neutral

AB or BA horizon:
Hue—10YR
Value—3 or 4
Chroma—3 or 4
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 5
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

2BC horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—stratified silt loam, loam, fine sandy loam, sandy loam, loamy fine sand, or loamy sand
Reaction—moderately acid to neutral

2C horizon:
Hue—7.5YR or 10YR
Value—4 to 8
Chroma—2 to 6
Texture—fine sand or sand
Reaction—slightly acid or neutral

Rockton Series

Typical Pedon

Rockton loam, 5 to 14 percent slopes, in a pasture; Cedar County, Iowa; about 2,100 feet east and 1,715 feet south of the northwest corner of sec. 9, T. 82 N., R. 4 W.; USGS Mechanicsville (IA) topographic quadrangle; lat. 41 degrees 55 minutes 41.8 seconds N. and long. 91 degrees 19 minutes 13 seconds W., NAD 83:

A1—0 to 7 inches; very dark brown (10YR 2/2) loam, very dark grayish brown (10YR 3/2) dry; moderate fine granular structure; friable; few very fine and fine roots; few fine dendritic tubular pores; slightly acid; gradual smooth boundary.
A2—7 to 14 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; few very fine and fine roots; few very fine dendritic tubular pores; few distinct very dark gray (10YR 3/1) organoargillans on faces of peds; moderately acid; gradual smooth boundary.
Bt1—14 to 22 inches; brown (10YR 4/3) loam; weak and moderate medium subangular blocky structure; friable; few fine roots; common distinct very dark grayish brown (10YR 3/2) organoargillans on faces of peds; strongly acid; gradual smooth boundary.
Bt2—22 to 27 inches; about 70 percent brown (7.5YR 4/4) and 30 percent reddish brown (5YR 4/4) sandy clay loam; moderate fine subangular blocky structure; friable; few fine roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; strongly acid; clear smooth boundary.
2Bt3—27 to 31 inches; about 80 percent brown (7.5YR 4/4) and 20 percent reddish brown (5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; strongly acid; abrupt smooth boundary.
2Bt4—31 to 33 inches; dark yellowish brown (10YR 4/4) clay; moderate medium subangular blocky structure; firm; many distinct dark brown (7.5YR 3/4) clay films on faces of peds; firm; moderately acid; abrupt smooth boundary.
2R—33 inches; limestone bedrock; weathered along joints and partially fractured in the upper 2 feet.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 18 inches
Depth to limestone bedrock: 20 to 40 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam, fine sandy loam, or silt loam
Reaction—strongly acid to slightly acid

Bt horizon:
Hue—10YR in the upper part; 5YR, 7.5YR, or 10YR in the lower part
Value—4 or 5
Chroma—3 or 4
Texture—loam, sandy clay loam, or clay loam
Reaction—strongly acid to slightly acid

2Bt horizon:
Hue—5YR, 7.5YR, or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—clay loam, silty clay loam, clay, or silty clay
Reaction—moderately acid to neutral

Rowley Series

Typical Pedon

Rowley silt loam, 0 to 2 percent slopes, in a cultivated field; Cedar County, Iowa; about 1,230 feet north and 565 feet east of the southwest corner of sec. 28, T. 81 N., R. 4 W.; USGS Cedar Bluff (IA) topographic quadrangle; lat. 41 degrees 47 minutes 26.2 seconds N. and long. 91 degrees 19 minutes 30.6 seconds W., NAD 83:

Ap—0 to 6 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; few very fine roots between peds; few fine dendritic tubular pores; neutral; abrupt smooth boundary.

A1—6 to 11 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; few very fine roots between peds; few fine dendritic tubular pores; neutral; clear smooth boundary.

A2—11 to 20 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; few very fine roots between peds; few fine dendritic tubular pores; slightly acid; clear smooth boundary.

Btg1—20 to 27 inches; dark grayish brown (10YR 4/2) silt loam; weak fine subangular blocky structure; friable; many distinct very dark grayish brown (10YR 3/2) organoargillans on all faces of peds; moderately acid; clear smooth boundary.

Btg2—27 to 33 inches; dark grayish brown (10YR 4/2) silt loam; weak medium subangular blocky structure; friable; common distinct very dark grayish brown (10YR 3/2) organoargillans on all faces of peds; moderately acid; clear smooth boundary.

Btg3—33 to 41 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium subangular blocky structure; friable; few distinct very dark grayish brown (10YR 3/2) organoargillans on all faces of peds; moderately acid; abrupt smooth boundary.

2Bt—41 to 54 inches; brown (10YR 4/3) sandy loam; weak fine subangular blocky structure; very friable; few distinct dark grayish brown (10YR 4/2) clay films on all faces of peds; moderately acid; clear smooth boundary.

3C—54 to 80 inches; brown (10YR 4/3) sand; single grain; loose; few fine faint very dark brown (10YR 2/2) irregular iron-manganese masses; moderately acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Depth to sandy alluvium: 40 to 60 inches

Ap or A horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 or 2
- Texture—silt loam
- Reaction—strongly acid to neutral

Bt or Btg horizon:
- Hue—10YR
- Value—4 or 5
- Chroma—2 to 4
- Texture—silt loam or silty clay loam
- Reaction—strongly acid to slightly acid

2Btg or 2Bt horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—sandy loam, fine sandy loam, or loam; stratified with these textures in some pedons
Reaction—strongly acid to slightly acid

3C horizon:
Hue—10YR or 2.5Y
Value—4 to 8
Chroma—2 to 6
Texture—sand
Reaction—strongly acid to slightly acid

Rozetta Series

Typical Pedon

Rozetta silt loam, on a northeast-facing slope of 1 percent, under mixed hardwoods; Stephenson County, Illinois; about 5 miles west of Eleroy; 150 feet south and 500 feet east of the center of sec. 18, T. 27 N., R. 6 E.; USGS Pearl City topographic quadrangle; lat. 42 degrees 20 minutes 00 seconds N. and long. 89 degrees 51 minutes 19 seconds W., NAD 27:

A—0 to 4 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 6/1) dry; weak medium granular structure; friable; many fine roots throughout; moderately acid; clear wavy boundary.
E—4 to 11 inches; dark grayish brown (10YR 4/2) silt loam; weak medium platy structure; friable; many fine roots throughout; strongly acid; clear smooth boundary.
BE—11 to 14 inches; brown (10YR 4/3) silty clay loam; weak medium subangular blocky structure; firm; many fine roots between peds; few faint brown (10YR 5/3) (dry) silt coatings on faces of peds; strongly acid; clear smooth boundary.
Bt1—14 to 21 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; firm; many fine roots between peds; many faint brown (10YR 5/3) clay films on faces of peds; strongly acid; clear smooth boundary.
Bt2—21 to 39 inches; brown (10YR 5/3) silty clay loam; moderate medium and coarse subangular blocky structure; firm; common fine roots between peds; many faint dark yellowish brown (10YR 4/4) clay films on faces of peds; common faint pale brown (10YR 6/3) (dry) silt coatings on faces of peds; few medium faint grayish brown (10YR 5/2) iron depletions in the matrix; common medium faint light yellowish brown (10YR 6/4) and brown (10YR 4/3) masses of iron in the matrix; strongly acid; clear smooth boundary.
Bt3—39 to 50 inches; yellowish brown (10YR 5/4) silty clay loam; weak coarse subangular blocky structure; firm; common fine roots throughout; few faint brown (10YR 4/3) clay films on faces of peds; common medium faint pale brown (10YR 6/3) and common medium distinct grayish brown (10YR 5/2) iron depletions in the matrix; moderately acid; clear smooth boundary.
C—50 to 60 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; common medium distinct dark grayish brown (10YR 4/2) iron depletions in the matrix; slightly acid.

Range in Characteristics

Depth to carbonates: More than 60 inches

Ap or A horizon:
- Hue—10YR
- Value—3 to 5
- Chroma—1 to 3
- Texture—silt loam or silty clay loam
- Reaction—moderately acid to neutral

E horizon:
- Hue—10YR
- Value—4 to 6
- Chroma—2 or 3
- Texture—silt loam
- Reaction—very strongly acid to moderately acid

Bt horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6
- Chroma—3 to 6
- Texture—silty clay loam
- Reaction—very strongly acid to neutral

C horizon:
- Hue—10YR
- Value—4 to 6
- Chroma—2 to 6
- Texture—silt loam or silty clay loam
- Reaction—slightly acid to slightly alkaline

Saude Series

Typical Pedon

Saude loam, 0 to 2 percent slopes, in a cultivated field; Cedar County, Iowa; about 318 feet east and 1,444 feet north of the southwest corner of sec. 28, T. 81 N., R. 4 W.; USGS Cedar Bluff (IA) topographic quadrangle; lat. 41 degrees 47 minutes 28.5 seconds N. and long. 91 degrees 19 minutes 33.9 seconds W., NAD 83:

Ap—0 to 6 inches; very dark brown (10YR 2/2) loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; firm; few very fine roots between peds; few fine dendritic tubular pores; neutral; clear smooth boundary.

A—6 to 14 inches; very dark brown (10YR 2/2) loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure parting to weak fine granular; firm; few very fine roots between peds; few fine dendritic tubular pores; slightly acid; clear smooth boundary.

BA—14 to 20 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; few very fine roots between peds; few fine dendritic tubular pores; few distinct very dark grayish brown (10YR 3/2) organic stains on all faces of peds; moderately acid; clear smooth boundary.

Bw1—20 to 28 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; few very fine roots between peds; few fine dendritic tubular pores; moderately acid; clear smooth boundary.

Bw2—28 to 34 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine subangular blocky structure; friable; few very fine roots between peds; few fine dendritic tubular pores; moderately acid; abrupt smooth boundary.
2BC—34 to 46 inches; about 80 percent dark yellowish brown (10YR 4/4) and 20 percent dark yellowish brown (10YR 4/6), stratified fine sand and loamy sand; weak very fine subangular blocky structure; very friable; strongly acid; abrupt smooth boundary.
2C1—46 to 66 inches; about 70 percent yellowish brown (10YR 5/4) and 30 percent dark yellowish brown (10YR 4/4), stratified sand and loamy sand; single grain; loose; moderately acid; abrupt smooth boundary.
2C2—66 to 80 inches; yellowish brown (10YR 5/4) coarse sand; single grain; loose; moderately acid.

Range in Characteristics

Depth to sandy and gravelly materials: 20 to 40 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam or sandy loam
Reaction—moderately acid to neutral

AB or BA horizon:
Hue—7.5YR or 10YR
Value—2 to 4
Chroma—1 to 4
Texture—loam or sandy loam
Reaction—moderately acid to neutral

Bw horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—loam or sandy loam
Reaction—strongly acid or moderately acid

2BC and 2C horizons:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—gravelly coarse sand, coarse sand, loamy sand, or sand
Reaction—strongly acid to slightly acid

Seaton Series

Typical Pedon

Seaton silt loam, 18 to 25 percent slopes, in a CRP field; Iowa County, Iowa; about 100 feet south and 2,100 feet east of the northwest corner of sec. 11, T. 81 N., R. 10 W.; USGS Amana (IA) topographic quadrangle; lat. 41 degrees 50 minutes 47.2 seconds N. and long. 91 degrees 59 minutes 11.2 seconds W., NAD 83:

Ap—0 to 5 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; very friable; many fine roots; common fine tubular pores; slightly acid; clear smooth boundary.

E—5 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium platy structure; very friable; many fine roots; common fine tubular pores; slightly acid; clear smooth boundary.
Bt1—8 to 17 inches; dark yellowish brown (10YR 4/4) silt loam; weak very fine and fine subangular blocky structure; very friable; common fine roots; common fine tubular pores; few distinct brown (10YR 4/3) clay films on faces of peds; moderately acid; gradual smooth boundary.
Bt2—17 to 31 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; very friable; common fine roots; common fine tubular pores; common distinct brown (10YR 5/3) clay films on faces of peds; moderately acid; gradual smooth boundary.
Bt3—31 to 48 inches; yellowish brown (10YR 5/4) silt loam; weak medium and coarse subangular blocky structure; very friable; common fine roots; common fine tubular pores; few faint yellowish brown (10YR 5/4) clay films on faces of peds; moderately acid; clear smooth boundary.
BC—48 to 60 inches; yellowish brown (10YR 5/4) silt loam; weak medium and coarse prismatic structure; very friable; few fine roots; common fine tubular pores; slightly acid; clear smooth boundary.
C—60 to 80 inches; yellowish brown (10YR 5/6) silt loam; massive; very friable; common fine tubular pores; few fine distinct strong brown (7.5YR 5/8) redoximorphic concentrations; neutral.

Range in Characteristics

Depth to carbonates: More than 60 inches

Ap or A horizon:
Hue—10YR
Value—2 to 5
Chroma—2 or 3
Texture—silt loam or silt
Reaction—moderately acid to neutral

E horizon:
Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—silt loam or silt
Reaction—moderately acid to neutral

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—silt loam
Reaction—very strongly acid to neutral

BC horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—silt loam
Reaction—strongly acid to neutral

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6

Texture—silt loam or silt
Reaction—moderately acid to moderately alkaline

Sparta Series

Typical Pedon

Sparta loamy fine sand, terrace, 1 to 5 percent slopes, in a cultivated field; Cedar County, Iowa; about 2,015 feet west and 705 feet north of the southeast corner of sec. 24, T. 79 N., R. 3 W.; USGS Rochester (IA) topographic quadrangle; lat. 41 degrees 37 minutes 43.1 seconds N. and long. 91 degrees 08 minutes 25.8 seconds W., NAD 83:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; very friable; common fine roots; moderately acid; abrupt smooth boundary.

A—9 to 13 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; very friable; few very fine roots; moderately acid; clear smooth boundary.

AB—13 to 22 inches; dark brown (10YR 3/3) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; very friable; few very fine roots; moderately acid; gradual smooth boundary.

Bw1—22 to 39 inches; brown (7.5YR 4/3) loamy fine sand; weak medium and coarse subangular blocky structure; very friable; few very fine roots; few distinct organic stains on faces of peds; moderately acid; gradual smooth boundary.

Bw2—39 to 51 inches; brown (7.5YR 4/3) and yellowish brown (10YR 5/4) loamy fine sand; weak coarse subangular blocky structure; very friable; few very fine roots; moderately acid; clear smooth boundary.

Bw3—51 to 57 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; few very fine roots in top part of horizon; moderately acid; abrupt wavy boundary.

E and Bt—57 to 80 inches; brown (10YR 5/3) fine sand (E); single grain; loose; moderately acid; about 25 percent lamellae of strong brown (7.5YR 5/6) loamy fine sand (Bt); weak fine subangular blocky structure; very friable; moderately acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Depth to lamellae: 45 to 80 inches
Depth to carbonates: More than 80 inches

Ap or A horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy fine sand, loamy sand, fine sand, or sand
Reaction—strongly acid to neutral

AB horizon:
Hue—7.5YR or 10YR
Value—3
Chroma—2 or 3
Texture—loamy fine sand, loamy sand, fine sand, or sand
Reaction—strongly acid to slightly acid

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 6
Chroma—3 to 6
Texture—loamy fine sand, loamy sand, fine sand, or sand
Reaction—strongly acid to slightly acid

E and Bt horizon (E part):
Hue—7.5YR or 10YR
Value—5 or 6
Chroma—3 or 4
Texture—sand or fine sand
Reaction—strongly acid to slightly alkaline

E and Bt horizon (Bt part):
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—loamy sand, loamy fine sand, or fine sand
Reaction—strongly acid to slightly alkaline

Sperry Series

Typical Pedon

Sperry silt loam, 0 to 1 percent slopes, depressional, in a cultivated field; Cedar County, Iowa; about 2,610 feet west and 2,555 feet north of the southeast corner of sec. 2, T. 79 N., R. 1 W.; USGS Bennett (IA) topographic quadrangle; lat. 41 degrees 40 minutes 36.9 seconds N. and long. 90 degrees 55 minutes 41.9 seconds W., NAD 83:

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; common fine roots; few fine dendritic tubular pores; neutral; abrupt smooth boundary.

E1—10 to 14 inches; dark gray (10YR 4/1) silt loam, gray (10YR 5/1) dry; moderate thin platy structure; friable; few fine dendritic tubular pores; many distinct light gray (10YR 7/1) (dry) silt coatings on all faces of peds; few fine prominent strong brown (7.5YR 5/6) irregular masses of oxidized iron; moderately acid; abrupt smooth boundary.

E2—14 to 18 inches; dark gray (10YR 4/1) silt loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure parting to moderate medium platy; friable; many distinct very dark gray (10YR 3/1) organic stains on all faces of peds; common distinct light gray (10YR 7/1) (dry) silt coatings on all faces of peds; common medium prominent strong brown (7.5YR 5/6) irregular masses of oxidized iron; moderately acid; gradual smooth boundary.

Btg1—18 to 31 inches; dark gray (10YR 4/1) silty clay loam; moderate fine subangular blocky structure; firm; common distinct very dark gray (10YR 3/1) organoargillans on all faces of peds; common prominent light gray (10YR 7/1) (dry) silt coatings on surfaces along pores; common fine prominent yellowish brown (10YR 5/6) irregular masses of oxidized iron; moderately acid; gradual smooth boundary.

Btg2—31 to 44 inches; gray (2.5Y 5/1) silty clay loam; moderate medium subangular blocky structure; firm; common prominent black (10YR 2/1) organoargillans on all faces of peds; common fine distinct light olive brown (2.5Y 5/4) and common fine

prominent yellowish brown (10YR 5/6) irregular masses of oxidized iron; slightly acid; gradual smooth boundary.

Btg3—44 to 61 inches; olive gray (5Y 5/2) silty clay loam; moderate coarse prismatic structure; firm; common prominent black (10YR 2/1) organoargillans on surfaces along pores; many medium prominent strong brown (7.5YR 5/6) irregular masses of oxidized iron; slightly acid; gradual smooth boundary.

BCg—61 to 69 inches; olive gray (5Y 5/2) silty clay loam; weak coarse prismatic structure; friable; few prominent black (10YR 2/1) organoargillans on vertical faces of peds; many medium prominent strong brown (7.5YR 5/6) irregular masses of oxidized iron; neutral; gradual smooth boundary.

Cg—69 to 80 inches; olive gray (5Y 5/2) silt loam; massive; friable; common medium prominent strong brown (7.5YR 5/6) irregular masses of oxidized iron; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 12 inches
Depth to carbonates: More than 60 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

E horizon:
Hue—10YR
Value—4 or 5
Chroma—1 or 2
Texture—silt loam
Reaction—moderately acid to neutral

Btg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 6
Chroma—1 or 2
Texture—silty clay loam or silty clay
Reaction—strongly acid to neutral

BCg and Cg horizons:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—silty clay loam or silt loam
Reaction—slightly acid to slightly alkaline

Spillville Series

Typical Pedon

Spillville loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; Cedar County, Iowa; about 1,300 feet west and 1,175 feet north of the southeast corner of sec. 3, T. 79 N., R. 2 W.; USGS Lime City (IA) topographic quadrangle; lat. 41 degrees 40 minutes 23 seconds N. and long. 91 degrees 03 minutes 33.2 seconds W., NAD 83:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; few very fine roots; few fine dendritic tubular pores; neutral; abrupt smooth boundary.
A1—8 to 28 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; few very fine roots; few fine dendritic tubular pores; neutral; gradual smooth boundary.
A2—28 to 43 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; few very fine roots; few fine dendritic tubular pores; slightly acid; clear smooth boundary.
AC—43 to 56 inches; dark gray (10YR 4/1) fine sandy loam; weak medium subangular blocky structure; friable; few very dark gray (10YR 3/1) organic stains on faces of peds; common fine distinct dark yellowish brown (10YR 4/4) irregular iron-manganese masses; slightly acid; gradual smooth boundary.
C—56 to 80 inches; dark gray (10YR 4/1) sandy loam; massive; friable; common fine distinct dark yellowish brown (10YR 3/4) irregular masses of oxidized iron; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 40 to 60 inches
Depth to carbonates: More than 40 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam or silt loam
Reaction—moderately acid to slightly alkaline

AC horizon:
Hue—10YR or 2.5Y
Value—2 to 4
Chroma—1 or 2
Texture—loam, silt loam, sandy clay loam, fine sandy loam, or sandy loam
Reaction—moderately acid to neutral

C horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—1 to 3
Texture—loam, sandy clay loam, loamy sand, fine sandy loam, or sandy loam
Reaction—moderately acid to neutral

Tama Series

Typical Pedon

Tama silty clay loam, 5 to 9 percent slopes, in a cultivated field; Cedar County, Iowa; about 360 feet north and 2,110 feet east of the southwest corner of sec. 9, T. 81 N., R. 3 W.; USGS Tipton West (IA) topographic quadrangle; lat. 41 degrees 50 minutes 19.8 seconds N. and long. 91 degrees 12 minutes 10.3 seconds W., NAD 83:

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; common very fine roots; common fine dendritic tubular pores; slightly acid; abrupt smooth boundary.

A1—8 to 16 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; friable; few very fine roots; few fine dendritic tubular pores; moderately acid; gradual smooth boundary.
A2—16 to 20 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 4/3) dry; moderate medium granular structure; friable; few very fine roots; few fine dendritic tubular pores; strongly acid; clear smooth boundary.
BA—20 to 23 inches; about 70 percent brown (10YR 4/3) and 30 percent very dark grayish brown (10YR 3/2) silty clay loam; moderate fine subangular blocky structure; friable; few fine dendritic tubular pores; strongly acid; abrupt smooth boundary.
Bt1—23 to 32 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; few fine dendritic tubular pores; common distinct dark grayish brown (10YR 4/2) clay films on all faces of peds; few distinct dark brown (10YR 3/3) organic stains on all faces of peds; strongly acid; gradual smooth boundary.
Bt2—32 to 38 inches; brown (10YR 4/3) silty clay loam; moderate medium angular blocky and subangular blocky structure; friable; few fine dendritic tubular pores; common distinct dark grayish brown (10YR 4/2) clay films on all faces of peds; few distinct dark brown (10YR 3/3) and very dark grayish brown (10YR 3/2) organic stains on all faces of peds; moderately acid; gradual smooth boundary.
Bt3—38 to 46 inches; yellowish brown (10YR 5/4) silty clay loam; weak fine subangular blocky structure; friable; few fine dendritic tubular pores; few distinct dark grayish brown (10YR 4/2) clay films on surfaces along pores; common fine distinct very dark brown (10YR 2/2) spherical manganese masses; common fine distinct strong brown (7.5YR 4/6) irregular masses of oxidized iron; common fine faint light olive brown (2.5Y 5/3) irregular masses of reduced iron; slightly acid; gradual smooth boundary.
BC—46 to 54 inches; yellowish brown (10YR 5/4) silty clay loam; weak fine subangular blocky structure; friable; few fine distinct very dark brown (10YR 2/2) spherical manganese masses; common fine distinct strong brown (7.5YR 5/6) irregular masses of oxidized iron; common medium faint light olive brown (2.5Y 5/3) irregular masses of reduced iron; slightly acid; gradual smooth boundary.
C1—54 to 69 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; common fine distinct very dark brown (10YR 2/2) spherical manganese masses; common medium distinct strong brown (7.5YR 5/6) irregular masses of oxidized iron; many medium faint light olive brown (2.5Y 5/3) irregular masses of reduced iron; neutral; clear smooth boundary.
C2—69 to 80 inches; brown (10YR 5/3) silt loam; massive; friable; few fine distinct very dark brown (10YR 2/2) spherical manganese masses; many coarse prominent strong brown (7.5YR 5/6) irregular masses of oxidized iron in the matrix; many medium faint light olive brown (2.5Y 5/3) irregular masses of reduced iron; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: More than 44 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam or silt loam
Reaction—strongly acid to neutral

BA horizon (where present):
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—silty clay loam or silt loam
Reaction—strongly acid to slightly acid

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam or silt loam
Reaction—strongly acid to slightly acid

BC horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam or silty clay loam
Reaction—strongly acid to neutral

C horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—silt loam or silty clay loam
Reaction—strongly acid to neutral

Taxadjunct features: The representative pedons for the moderately eroded and severely eroded Tama soils in map units 120C, 120C2, and 120D2 are taxadjuncts because they do not meet the thickness requirements for a Mollisol. These pedons are classified as fine-silty, mixed, superactive, mesic Mollic Hapludalfs.

Tell Series

Typical Pedon

Tell silt loam, 2 to 5 percent slopes, in a wooded area; Iowa County, Iowa; about 2,600 feet north and 440 feet west of the southeast corner of sec. 3, T. 80 N., R. 10 W.; USGS Amana (IA) topographic quadrangle; lat. 41 degrees 46 minutes 01.2 seconds N. and long. 91 degrees 52 minutes 20.7 seconds W., NAD 83:

A—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many fine roots; moderately acid; abrupt smooth boundary.
E—5 to 10 inches; brown (10YR 5/3) silt loam; weak thin and medium platy structure; friable; common very fine roots; moderately acid; clear smooth boundary.
BE—10 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine and medium subangular blocky structure; friable; common very fine roots; strongly acid; clear smooth boundary.
Bt—14 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.
2BC—27 to 31 inches; yellowish brown (10YR 5/4) loam; weak fine and medium subangular blocky structure; friable; strongly acid; clear smooth boundary.

2C1—31 to 58 inches; brown (7.5YR 5/4) sand; single grain; loose; strongly acid; clear smooth boundary.
2C2—58 to 80 inches; brown (7.5YR 4/4) loamy sand; single grain; loose; slightly acid.

Range in Characteristics

Depth to carbonates: More than 60 inches

A or Ap horizon:
Hue—10YR
Value—2 to 5
Chroma—2 to 5
Texture—silt loam
Reaction—strongly acid to neutral

E horizon (where present):
Hue—10YR
Value—4 or 5
Chroma—2 to 4
Texture—silt loam
Reaction—strongly acid to slightly acid

BE horizon:
Hue—10YR
Value—3 to 5
Chroma—3 or 4
Texture—silt loam
Reaction—strongly acid to slightly acid

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam or silt loam
Reaction—strongly acid to slightly acid

2BC horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—loam, sandy loam, or sandy clay loam
Reaction—strongly acid to slightly acid

2C horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 8
Texture—sand or loamy sand
Reaction—strongly acid to slightly acid

Thebes Series

Typical Pedon

Thebes silt loam, on a north-facing slope of 7 percent, in a cultivated field; Mercer County, Illinois; about 3 miles southeast of Aledo; 1,060 feet west and 1,800 feet south of the northeast corner of sec. 3, T. 13 N., R. 3 W.; USGS Aledo East

topographical quadrangle; lat. 41 degrees 09 minutes 02 seconds N. and long. 90 degrees 42 minutes 30 seconds W., NAD 27:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; slightly acid; clear smooth boundary.

Bt1—9 to 14 inches; yellowish brown (10YR 5/4) silty clay loam; weak fine and medium subangular blocky structure; friable; few distinct brown (10YR 5/3) clay films on faces of peds and in pores; strongly acid; clear wavy boundary.

Bt2—14 to 26 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; common distinct brown (10YR 4/3) clay films on faces of peds and in pores; moderately acid; clear wavy boundary.

Bt3—26 to 31 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; common distinct brown (10YR 4/3) clay films on faces of peds and in pores; few medium faint pale brown (10YR 6/3) and few medium distinct strong brown (7.5YR 4/6) masses of iron accumulation in the matrix; slightly acid; clear wavy boundary.

2Bt4—31 to 40 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable; few distinct brown (10YR 4/3) clay films on faces of peds and in pores; common coarse faint pale brown (10YR 6/3) and common coarse distinct strong brown (7.5YR 4/6) masses of iron accumulation in the matrix; slightly acid; clear wavy boundary.

2BC—40 to 50 inches; about 55 percent yellowish brown (10YR 5/4) and 45 percent brown (7.5YR 4/4), stratified sandy loam and loamy sand; weak medium subangular blocky structure; friable; few medium distinct pale brown (10YR 6/3) masses of iron accumulation in the matrix; moderately acid; clear wavy boundary.

2C—50 to 80 inches; dark yellowish brown (10YR 4/4), stratified loamy sand and sand; single grain; loose; common medium and coarse faint brown (7.5YR 4/4) masses of iron accumulation in the matrix; slightly acid.

Range in Characteristics

Depth to carbonates: More than 80 inches

Ap or A horizon:
- Hue—10YR
- Value—4 or 5
- Chroma—2 to 4
- Texture—silt loam or silty clay loam
- Reaction—slightly acid or neutral

E horizon (where present):
- Hue—10YR
- Value—4 or 5
- Chroma—3 to 6
- Texture—silt loam
- Reaction—moderately acid or slightly acid

Bt horizon:
- Hue—7.5YR or 10YR
- Value—4 or 5
- Chroma—3 to 6
- Texture—silty clay loam or silt loam
- Reaction—very strongly acid to neutral

2Bt horizon:
- Hue—7.5YR or 10YR
- Value—4 or 5

Chroma—4 to 6
Texture—loam, sandy loam, fine sandy loam, sandy clay loam, or clay loam
Reaction—very strongly acid to slightly acid

2BC horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—sandy loam, loamy sand, or sand
Reaction—very strongly acid to slightly acid

2C horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 6
Texture—loamy sand, fine sand, loamy fine sand, or sand
Reaction—strongly acid to neutral

Vesser Series

Typical Pedon

Vesser silt loam, in a cultivated field on a nearly level flood plain; Wayne County, Iowa; about 3 miles north and 1 mile east of Corydon; about 875 feet west and 2,100 feet north of the southeast corner of sec. 5, T. 69 N., R. 21 W.; USGS Corydon (IA) topographic quadrangle; lat. 40 degrees 48 minutes 07 seconds N. and long. 93 degrees 17 minutes 32 seconds W., NAD 83:

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure parting to weak fine granular; friable; slightly acid; abrupt smooth boundary.

A—8 to 12 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; moderately acid; clear smooth boundary.

E1—12 to 20 inches; very dark gray (10YR 3/1) and dark gray (10YR 4/1) silt loam, dark gray (10YR 4/1) kneaded, gray (10YR 6/1) dry; weak fine subangular blocky structure; friable; common dark accumulations (oxides) and concretions; few fine faint dark brown (7.5YR 3/2) redoximorphic concentrations; strongly acid; gradual smooth boundary.

E2—20 to 31 inches; dark gray (10YR 4/1) silt loam, dark grayish brown (10YR 4/2) kneaded; weak medium platy and weak medium subangular blocky structure; friable; light gray (10YR 7/1) (dry) silt coatings on faces of peds; common grayish brown (10YR 5/2) coatings on faces of peds; common black (10YR 2/1) accumulations (oxides) and concretions; few fine faint dark brown (7.5YR 3/2) redoximorphic concentrations; strongly acid; clear smooth boundary.

Btg1—31 to 37 inches; dark gray (10YR 4/1) silty clay loam, dark gray (10YR 4/1) kneaded; moderate fine and medium prismatic structure parting to moderate medium subangular blocky; friable; light gray (10YR 7/1) (dry) silt and fine sand coatings on faces of peds; common prominent black (10YR 2/1) clay films on faces of peds; many gray (10YR 5/1) coatings on faces of peds; common black accumulations (oxides) and concretions; common fine prominent brown (7.5YR 4/4) redoximorphic concentrations; strongly acid; gradual smooth boundary.

Btg2—37 to 46 inches; dark gray (10YR 4/1) silty clay loam; moderate medium prismatic structure parting to weak medium subangular blocky; firm; common prominent black (N 2/) clay films on all faces of peds; few black accumulations

(oxides) and concretions; few fine distinct brown (7.5YR 4/4) redoximorphic concentrations; moderately acid; gradual smooth boundary.
BCg—46 to 60 inches; dark gray (10YR 4/1) and very dark gray (10YR 3/1) silty clay loam; weak medium prismatic structure; firm; light gray (10YR 7/1) (dry) coatings on faces of peds; moderately acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: More than 60 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—strongly acid to slightly acid

E horizon:
Hue—10YR
Value—3 to 5
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—very strongly acid to moderately acid

Btg and BCg horizons:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—1 or 2
Texture—silty clay loam
Reaction—strongly acid or moderately acid

Walford Series

Typical Pedon

Walford silt loam, 0 to 2 percent slopes, in a cultivated field; Cedar County, Iowa; about 75 feet west and 1,950 feet north of the southeast corner of sec. 27, T. 80 N., R. 1 W.; USGS Bennett (IA) topographic quadrangle; lat. 41 degrees 42 minutes 16.3 seconds N. and long. 90 degrees 56 minutes 16.8 seconds W., NAD 83:

Ap—0 to 6 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine and medium granular structure; friable; slightly acid; abrupt smooth boundary.
E1—6 to 9 inches; dark grayish brown (10YR 4/2) silt loam; weak thin platy structure; friable; few fine faint dark brown (7.5YR 3/2) redoximorphic concentrations; moderately acid; clear smooth boundary.
E2—9 to 15 inches; grayish brown (10YR 5/2) silt loam; weak thin platy structure; friable; few fine distinct brown (7.5YR 4/4) redoximorphic concentrations; moderately acid; clear smooth boundary.
BEg—15 to 22 inches; grayish brown (10YR 5/2) silt loam; weak fine and medium subangular blocky structure; friable; few dark reddish brown (5YR 3/2) iron-manganese concretions; many fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly acid; clear smooth boundary.
Btg1—22 to 30 inches; light brownish gray (2.5Y 6/2) silty clay loam; weak fine prismatic structure parting to moderate fine subangular blocky; firm; common distinct grayish brown (2.5Y 5/2) clay films on faces of peds; many distinct light

gray (10YR 7/2) (dry) silt coatings on faces of peds; many fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly acid; gradual smooth boundary.

Btg2—30 to 40 inches; light brownish gray (2.5Y 6/2) silty clay loam; moderate fine prismatic structure parting to moderate medium subangular blocky; firm; common distinct grayish brown (2.5Y 5/2) clay films on faces of peds; common prominent dark reddish brown (5YR 3/2) iron-manganese concretions; many coarse prominent strong brown (7.5YR 5/6) redoximorphic concentrations; moderately acid; gradual smooth boundary.

Btg3—40 to 50 inches; about 80 percent light brownish gray (2.5Y 6/2) and 20 percent strong brown (7.5YR 5/6) silty clay loam; weak medium prismatic structure; firm; common distinct grayish brown (2.5Y 5/2) clay films on faces of peds; moderately acid; gradual smooth boundary.

BCg—50 to 63 inches; about 60 percent light brownish gray (2.5Y 6/2) and 40 percent strong brown (7.5YR 5/6) silty clay loam; weak coarse prismatic structure; firm; many dark reddish brown (5YR 3/2) iron-manganese concretions; moderately acid; gradual smooth boundary.

Cg—63 to 80 inches; about 60 percent grayish brown (2.5Y 5/2) and 40 percent light olive brown (2.5Y 5/3) silt loam; massive; friable; common medium prominent strong brown (7.5YR 4/6) irregular masses of iron-manganese; moderately acid.

Range in Characteristics

Depth to carbonates: More than 60 inches

Ap or A horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 or 2
- Texture—silt loam
- Reaction—slightly acid or neutral

E horizon:
- Hue—10YR or 2.5Y
- Value—4 to 6
- Chroma—1 or 2
- Texture—silt loam
- Reaction—strongly acid or moderately acid

BEg horizon (where present):
- Hue—10YR to 5Y
- Value—5 or 6
- Chroma—1 or 2
- Texture—silt loam
- Reaction—strongly acid or moderately acid

Btg horizon:
- Hue—10YR to 5Y
- Value—5 or 6
- Chroma—1 or 2
- Texture—silty clay loam
- Reaction—strongly acid or moderately acid

BCg horizon:
- Hue—2.5Y or 5Y
- Value—5 or 6
- Chroma—1 or 2

Texture—silty clay loam or silt loam
Reaction—strongly acid or moderately acid

Cg horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—silt loam
Content of clay—18 to 27 percent
Content of sand—5 to 20 percent
Reaction—moderately acid to slightly alkaline

Waubeek Series

Typical Pedon

Waubeek silt loam, 2 to 5 percent slopes, in a cultivated field; Cedar County, Iowa; about 1,132 feet west and 2,255 feet south of the northeast corner of sec. 14, T. 81 N., R. 4 W.; USGS Cedar Bluff (IA) topographic quadrangle; lat. 41 degrees 49 minutes 27.8 seconds N. and long. 91 degrees 16 minutes 21.7 seconds W., NAD 83:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common fine roots; common fine dendritic tubular pores; neutral; abrupt smooth boundary.

E—8 to 12 inches; brown (10YR 4/3) silt loam; weak medium platy structure parting to weak fine subangular blocky; friable; common fine roots; common fine dendritic tubular pores; few distinct very dark gray (10YR 3/1) organic stains on all faces of peds; slightly acid; abrupt smooth boundary.

Bt1—12 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; firm; common fine roots; few fine dendritic tubular pores; few distinct brown (10YR 4/3) clay films on all faces of peds; moderately acid; gradual smooth boundary.

Bt2—20 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; firm; few fine roots; few fine dendritic tubular pores; few distinct dark yellowish brown (10YR 4/4) clay films on all faces of peds; moderately acid; clear smooth boundary.

Bt3—27 to 40 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium and fine angular blocky structure; firm; few fine roots; few fine dendritic tubular pores; common distinct white (10YR 8/1) (dry) silt coatings on all faces of peds; common fine distinct strong brown (7.5YR 4/6) irregular masses of oxidized iron; moderately acid; abrupt smooth boundary.

2Bt4—40 to 52 inches; yellowish brown (10YR 5/6) sandy clay loam; weak fine subangular blocky structure; firm; common medium distinct yellowish brown (10YR 5/8) irregular masses of oxidized iron; common fine prominent weakly cemented black (7.5YR 2/1) irregular manganese nodules; about 4 percent subrounded gravel; strongly acid; abrupt smooth boundary.

2BC—52 to 69 inches; yellowish brown (10YR 5/4) loam; weak coarse prismatic structure; firm; very few distinct light gray (10YR 7/2) (dry) silt coatings on vertical faces of peds; common medium prominent strong brown (7.5YR 5/8) irregular masses of oxidized iron; about 2 percent subrounded gravel; slightly acid; gradual smooth boundary.

2C—69 to 80 inches; dark yellowish brown (10YR 4/4) loam; massive; firm; common medium distinct grayish brown (10YR 5/2) irregular masses of reduced iron;

common medium distinct yellowish brown (10YR 5/6) irregular masses of oxidized iron; about 1 percent subrounded gravel; slightly acid.

Range in Characteristics

Depth to carbonates: More than 60 inches
Depth to till: 20 to 40 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam
Reaction—moderately acid to neutral

E horizon:
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam
Reaction—moderately acid to neutral

BE horizon (where present):
Hue—10YR
Value—4
Chroma—3
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam or silty clay loam
Reaction—strongly acid to slightly acid

2Bt horizon:
Hue—7.5YR or 10YR
Value—5
Chroma—4 to 8
Texture—loam, clay loam, or sandy clay loam
Reaction—strongly acid to neutral

2BC or 2C horizon:
Hue—7.5YR or 10YR
Value—4 to 8
Chroma—4 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline

Whittier Series

Typical Pedon

Whittier silt loam, 2 to 5 percent slopes, in a cultivated field; Cedar County, Iowa; about 640 feet north and 150 feet west of the southeast corner of sec. 17, T. 80 N., R. 2 W.; USGS Lime City (IA) topographic quadrangle; lat. 41 degrees 43 minutes 47.8 seconds N. and long. 91 degrees 05 minutes 37.2 seconds W., NAD 83:

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; few fine roots; few fine moderate-continuity dendritic tubular pores; neutral; abrupt smooth boundary.

E—7 to 13 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium platy structure parting to weak very fine subangular blocky; friable; few fine roots; few fine moderate-continuity dendritic tubular pores; neutral; clear smooth boundary.

BE—13 to 19 inches; brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; friable; few fine roots; very few distinct light brownish gray (10YR 6/2) silt coatings on all faces of peds; slightly acid; clear smooth boundary.

Bt1—19 to 24 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots in cracks; very few distinct dark grayish brown (10YR 4/2) clay films on all faces of peds; very few distinct pale brown (10YR 6/3) silt coatings on all faces of peds; slightly acid; gradual smooth boundary.

Bt2—24 to 36 inches; dark yellowish brown (10YR 4/4) silty clay loam; strong medium subangular blocky structure; friable; few fine roots in cracks; very few distinct dark grayish brown (10YR 4/2) clay films on all faces of peds; very few prominent very pale brown (10YR 8/2) silt coatings on all faces of peds; moderately acid; gradual smooth boundary.

BC—36 to 42 inches; brown (10YR 4/3) sandy loam; weak coarse subangular blocky structure; friable; very few prominent light brownish gray (10YR 6/2) silt coatings on all faces of peds; moderately acid; clear smooth boundary.

2E—42 to 50 inches; yellowish brown (10YR 5/4) loamy fine sand; weak coarse subangular blocky structure; very friable; strongly acid; gradual smooth boundary.

2E and Bt—50 to 80 inches; yellowish brown (10YR 5/6) fine sand (E); single grain; loose; lamellae of dark yellowish brown (10YR 4/6) loamy sand (Bt) 1/2 to 1 inch thick; few fine distinct grayish brown (10YR 5/2) irregular iron depletions along lamellae; moderately acid.

Range in Characteristics

Depth to sandy material: 24 to 40 inches

Ap or A horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 or 2
- Texture—silt loam
- Reaction—slightly acid or neutral

E horizon:
- Hue—10YR
- Value—4
- Chroma—2 or 3
- Texture—silt loam
- Reaction—moderately acid to neutral

BE and Bt horizons:
- Hue—10YR
- Value—4 or 5
- Chroma—3 or 4
- Texture—silty clay loam
- Reaction—moderately acid or slightly acid

BC horizon:
Hue—10YR
Value—4 or 5
Chroma—4 to 6
Texture—loam or sandy loam
Reaction—moderately acid

2E and Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—4 to 6
Texture—fine sand, loamy fine sand, or loamy sand
Reaction—strongly acid or moderately acid

Formation of the Soils

This section describes the major factors of soil formation and the processes of horizon differentiation.

Factors of Soil Formation

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by five major soil-forming factors: 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, or lay of the land; 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 are the active factors of soil formation. They act on the parent material and slowly change it into a natural body that has genetically related horizons, or layers. 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 transformation of the parent material into a soil. Some time is always needed for the development of soil horizons. A long period of time 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.

Parent Material

In Cedar County, parent material has affected the general character of the soil profile. Most of the soils in the county formed in loess, or windblown material; in glacial till, or ice-laid material; in alluvium, or water-deposited material; or in eolian, or windblown, sands. Some soils formed in organic deposits and residuum, although these kinds of parent material are not extensive in the county.

Loess is the most important parent material in the county. It consists of windblown silt that mantles glacial drift. The loess was deposited during the Wisconsin age. Unweathered loess is calcareous silt loam. The loess varies in thickness. In some areas, there is no loess mantle over the till or the loess is only about 40 inches thick. In the rest of the county, the loess ranges from 10 to 30 feet in thickness.

The loess-mantled areas in Cedar County have been divided into four categories: 1) loess-mantled Cleona Channel, 2) thick-loess-mantled Iowan surface, 3) loess-mantled Iowan surface, and 4) thick-loess-mantled Yarmouth-Sangamon surface (Miller, 1974).

The first area, which is just north of Durant, is the loess-mantled Cleona Channel and the loess-mantled Lake Calvin stream terraces. The Cleona Channel is an Illinoian diversion channel of the Mississippi River that extends from the mouth of the Wapsipinicon River southwest across Scott, Cedar, and Muscatine Counties. This

channel has been filled with 200 to 300 feet of unconsolidated sediment. It extends across the southeast corner of Cedar County.

The second area is the thick-loess-mantled Iowan surface, where the loess is 9 to 18 feet deep over a truncated glacial till surface (Simonson and others, 1952). An example is the "Sunbury Flats," in the eastern part of the county. This plain has a swell-swale topography. The common landscape features are a convex knob, a linear backslope 1,000 feet or more long, a slope of 1 to 3 percent, and a concave depression at the base of the slope. Dissection by streams is minimal.

Some of the soils on the "Sunbury Flats" are characterized by a buried sand sheet that is mantled by loess and underlain by glacial till. In these areas, well drained or moderately well drained soils are on the swells. If no sand is between the loess and the glacial till, somewhat poorly drained and poorly drained soils are in the swales.

The soils on the "Sunbury Flats" have thick, gray, grainy silt coatings on the faces of peds. These coatings are not so common in the rest of the soils on the thick-loess-mantled Iowan surface. The Sunbury area may have been either an isolated forest island in the middle of the prairie region or within that part of eastern Iowa where forest vegetation was dominant during part of the Holocene period but where soils having properties characteristic of forest soils were removed by erosion on hillsides and secondary and tertiary interfluves (Arnold, 1965).

Tama silt loam and Atterberry and Walford soils are examples of soils on the "Sunbury Flats." Downs soils and Tama silty clay loam are examples of soils that formed on the thick-loess-mantled Iowan surface but are not on the "Sunbury Flats."

The third area is the loess-mantled Iowan surface, where the loess is less than 6 feet thick. In places there is no loess or only 20 to 60 inches of loess. In this area the loess mantles the older Pre-Illinoian till surface. This area is known as the Iowan Erosion Surface complex (Ruhe and others, 1968). Dinsdale, Klinger, Maxfield, Waubeek, Franklin, and Ansgar soils are dominant in this area.

Scattered throughout the Iowan Erosion Surface are long ridges called "pahas" (Ruhe and others, 1968; Scholtes, 1955). These loess-capped ridges, which are oriented northwest to southeast, stand apart on the Iowan plain.

The fourth area is the thick-loess-mantled Yarmouth-Sangamon surface. It is on stable upland summits and is the highest surface. The loess is 16 or more feet thick on the broader ridges and as much as 32 feet thick where it abuts the Iowan Erosion Surface (Ruhe and others, 1968). The sediment package in this area is characterized by Wisconsin loess overlying a Yarmouth-Sangamon paleosol that developed in Pre-Illinoian tills (Ruhe and others, 1968).

Downs and Fayette soils and Tama silty clay loam formed in this area. In places the paleosol is exposed. In the steeper areas, till is exposed. Lindley soils formed in these areas.

Glacial drift is rock material transported by glacial ice or running water derived from melting glacial ice. It includes glacial till. *Glacial till* is unsorted sediment with particles ranging from boulders to clay (Ruhe, 1969). Glacial drift is the second most important parent material in the formation of the soils in Cedar County. During the Pleistocene, there were multiple ice advances into Iowa. The record of these ice invasions is contained in the unconsolidated rock material that was deposited by the melting ice and meltwater streams (fig. 13). Collectively, these older ice advances are recognized as the Pre-Illinoian tills.

The southern two-thirds of Cedar County has loess covering the Pre-Illinoian tills. The different kinds of till are not readily differentiated in the county. Geologic erosion has removed the loess on some of the side slopes. The till and paleosol of the glaciations and interglacial periods have been exposed on the side slopes. The paleosols developed in the till during the Yarmouth and Sangamon interglacial stages. This soil development occurred before the loess was deposited. Small areas

Figure 13.—A glacial erratic in a soybean field on the Iowan Erosion Surface.

where paleosols or glacial till is exposed are shown on the map sheets by a red clay or glacial till spot symbol. Larger areas are mapped as Lindley soils.

Much of the northern part of Cedar County is a multilevel sequence of the Iowan Erosion Surface (Ruhe, 1969). Many of the levels are cut into the Pre-Illinoian till. The multilevel Iowan Erosion Surface is arranged in a series of steps from the major drainageways toward bounding divides. It is marked by a stone line where it cuts through the Pre-Illinoian till (Ruhe, 1959). A stone line occurs on all levels of the stepped surface, and it passes under the alluvium along the drainageways. The highest areas on the Iowan Erosion Surface are pahas (elliptical hills or elongated ridges). The core of the paha provides a glimpse of the old land surface prior to erosional stripping. In these areas, the Sangamon Geosol is commonly developed into the older underlying Pre-Illinoian till.

Bassett and Kenyon soils formed in glacial till on the Iowan Erosion Surface. These soils have loamy surficial sediments about 1 to 2 feet deep over glacial material. A stone line or pebble band commonly separates the friable loamy sediment from the firm loam or clay loam glacial till (Schermerhorn and others, 1979).

Alluvium consists of sediment transported and deposited by water. Alluvial deposits of Late Wisconsin age are on the flood plains and terraces along watercourses in Cedar County. They consist of lenses and layers of sand, gravel, silt, and clay. This alluvial material varies in thickness. Along the major streams it is very thick, but along the smaller streams it is less than 5 feet thick. Saude soils formed in loamy alluvium over sand and gravel, and Richwood soils formed in silty material that contains some stratified sand below a depth of 4 feet (Schermerhorn and others, 1979).

Some alluvial material has accumulated at the foot of the slope on which it originated. This material, called local alluvium, retains many characteristics of the soils in the areas from which it has eroded. Ely soils, for example, are at the foot of the slopes directly below loess-derived soils.

When streams overflow their channels and water spreads over the flood plains, the coarse textured material is deposited first. Fine textured sediment, such as silt, is

deposited when the floodwater moves more slowly. After the floodwater has receded, the finest particles, or clay, settle from the water left standing on the lowest part of the flood plain. Kennebec and Nodaway soils formed in silty material, and Spillville soils formed in coarser textured loamy material. Colo soils, which are on the lowest part of the flood plain, have a solum of silty clay loam and contain more clay than the soils on the higher parts of the flood plain (Schermerhorn, 1983).

In the southern part of the county is a basin with an extensive complex of alluvial stream terraces. This basin is formally called the Pleistocene Lake Calvin. It covers parts of Cedar, Johnson, Washington, Muscatine, and Louisa Counties. It has three distinct terrace surfaces, identified as "high," "intermediate," and "low" terraces. These terraces were formed with materials from the Iowan Erosion Surface (Ruhe and Prior, 1970). Wisconsin-age loess mantles the adjacent uplands and the high and intermediate terrace surfaces; the lower terrace, however, is not mantled by loess. Subsurface studies show that these terrace sediments are made up of gravel, sand, silt, and clay, which range in thickness from 35 to more than 100 feet.

The basin was first considered to be a lacustrine feature in 1894 by Samuel Calvin (Calvin, 1897). In 1898, J.A. Udden named the basin for Calvin. Walter H. Schoewe produced the first major study of the Lake Calvin area in 1920 (Schoewe, 1920). Since that time, several studies have been made relating to Lake Calvin (Ruhe and others, 1968; Ruhe and Prior, 1970). Radiocarbon dating and the results of test drilling undertaken to determine the position of the Yarmouth-Sangamon paleosol surface indicate that the Lake Calvin terraces are younger than Illinoian age and are probably of Wisconsin age. These studies fit the chronology of the Iowan Erosion Surface. Other test drilling demonstrated stratigraphic complexities within the basin that indicated the presence of both Illinoian and Wisconsin sediment. Such investigations showed a need for detailed reexamination of Lake Calvin, including systematic drilling to determine the complete sequence of sediments within the basin. Until more information is available, the basin remains an area of complex stratigraphic and geomorphic relationships. In 1984, Esling undertook a regional study to document extensive post-Illinoian alluvial deposits that had accumulated in major valleys in eastern Iowa (Esling, 1984). He identified three major terrace assemblages with differing stratigraphy and age: Early Phase High Terrace (EPHT), Late Phase High Terrace (LPHT), and Low Terrace (LT). EPHT deposits are characterized by the presence of Peoria and Pisgah Formation sediments overlying a Sangamon Geosol in the underlying alluvium. Esling theorized that these terraces are older than 40,000 years B.P. but younger than the Illinoian sediments in eastern Iowa (Bettis, 1989). LPHT deposits are characterized by the presence of Peoria Formation loess grading down into underlying alluvium with no paleosol. These terraces developed prior to 25,000 years ago and were buried by loess before 12,500 years ago. The LPHT terraces are typically inset into EPHT deposits. The LT is the youngest terrace and is not buried by Peoria loess. In the study area, eolian dunes (Peoria Formation—sand facies) are present on the terrace surface and indicate that this terrace surface was deposited during Late Wisconsin through early Holocene time (12,500 to 10,000 years ago). Anderson (1986) conducted an extensive geoarcheology study of the Hawkeye Wildlife Area along the Iowa River valley in adjacent Johnson County. He identified a Woodfordian-age high terrace that is correlative with Esling's LT and with Holocene-age "low" and "intermediate" terraces. Anderson's intermediate terrace was an active flood plain throughout the early and mid Holocene. Anderson found that during late Holocene time, the alluvial history of the Iowa River valley has been dominated by lateral stream migration and channel belt formation. A similar alluvial history appears to be the case for the Cedar River valley in Cedar County.

Eolian material consists of windblown sand. In some areas the wind has carried fine sand from the stream channels and the flood plains to higher elevations (Prior, 1976). This dune sand has been deposited on low stream terraces, high stream terraces, and uplands commonly on the east or southeast side of the major streams. Chelsea, Dickinson, Lamont, and Sparta soils formed mainly in this eolian material.

Residuum is material derived from sedimentary rock that weathered in place. It is a very minor parent material in this county. The underlying bedrock for about three-fourths of the county is Silurian. The bedrock in the other one-fourth of the county, which is in the southwestern part, is Devonian. These two systems are made up principally of limestone, dolomite, and a small amount of shale. A very small area of the Pennsylvanian system is near Sunbury. This system has layers of shale, clay, siltstone, sandstone, and limestone and thick coal beds. None of these systems are level. They generally slope to the southwest about 20 feet per mile (Schermerhorn and others, 1979). Rockton soils formed in 20 to 40 inches of loess over limestone residuum. Emeline soils formed in 4 to 12 inches of loamy materials over limestone bedrock and residuum (fig. 14). Small areas where bedrock and/or residuum is exposed are shown on the map sheets by a special symbol.

Organic deposits consist of plant remains in various stages of decomposition. Organic soils commonly are in small wet areas where poor drainage has retarded the decay of plant remains that have accumulated over a period of time. The wet areas may be in upland drainageways, on sidehill seeps in the uplands, in depressions in the uplands, in outwash areas, or on stream terraces (Minger, 1991). The organic material in the county generally is about 10 to 60 inches deep over a mineral soil, but a few deposits are thicker. The mucky Klossner soils formed in this organic material. Small areas of organic soils are shown by a special symbol on the soil maps.

Figure 14.—A limestone outcrop in a farm field west of Massillon.

Climate

The soils in Cedar County have been forming under a midcontinental, subhumid climate for the past 5,000 years (Ruhe, 1956; Ruhe and others, 1957). The morphology and properties of the majority of the soils in Cedar County indicate that this climate was similar to the present climate. From 6,500 to 16,000 years ago, however, the climate probably was cool and moist. This type of climate was conducive primarily to the growth of forest vegetation (Ruhe, 1956; Ruhe and others, 1957). A study indicates that the climate during the Sangamon period of the Pleistocene Epoch was cool and moist and conducive mainly to the growth of conifers (Lane, 1941).

More recent work on the alluvial history of Mud Creek, in Cedar County, Iowa, indicates a change from coniferous to deciduous woodland about 10,500 years ago, a change from forest to prairie 5,500 years ago, and an expansion of forest and savanna around 3,000 years ago (Bettis and Autin, 1997). These changes in vegetation were probably tied to changes in climate from cool and moist conditions to drier conditions and then back to more moist conditions.

The influence of the general climate in a region is modified by local conditions in or near the developing soils. For example, soils on south-facing slopes formed under a micro-climate that was warmer and drier than the average climate of nearby areas. The low-lying, poorly drained soils on bottom land formed under wetter and colder conditions than those in most of the surrounding upland areas. These local differences influence the characteristics of the soils and account for some of the differences among soils in the same general climatic region.

Living Organisms

Many changes in climate and vegetation took place in Iowa during the post-glacial period (Lane, 1941; Ruhe, 1956). Spruce grew on the soils from 12,000 to 8,000 years ago. This type of vegetation was followed by a coniferous-deciduous forest, which lasted until about 6,500 years ago. At that time, grass became the dominant vegetation in the area.

For the past 5,000 years, the soils of Cedar County have been influenced by prairie grasses and some trees. Big bluestem and little bluestem were the main prairie grasses. The dominant trees were deciduous, mainly oak, hickory, ash, elm, and maple.

The effects of vegetation on soils similar to those in Cedar County have been studied recently. Evidence shows that the vegetation changed while soils formed in areas bordering trees and grasses. The morphology of Atterberry, Bassett, Downs, Mt. Carroll, Walford, and Waubeek soils reflects the influence of both trees and grasses. Trees influenced the formation of Chelsea, Fayette, Lindley, and Tell soils (Prill and Riecken, 1958). Grasses influenced the formation of Dickinson, Dinsdale, Ely, Garwin, Judson, Kenyon, Muscatine, Nevin, Pillot, Sparta, Sperry, and Tama soils.

Important changes take place when the soil is cultivated. Some of these changes have little effect on productivity, while others have a drastic effect. The changes caused by water erosion generally are the most significant. On many of the cultivated soils in the county, particularly the gently rolling to hilly soils, part or all of the original surface layer has been lost through sheet erosion. In places, shallow to deep gullies have formed.

In many fields that are cultivated year after year, the granular structure that was apparent when the prairies were undisturbed has broken down. In these fields the soil surface tends to crust and harden when it dries. Fine textured soils that have been plowed when too wet are less permeable than similar soils in undisturbed areas.

Humans have increased the productivity of some soils. Large areas of bottom-land soils, such as Colo soils, have been made suitable for cultivation because drainage ditches have been dug and diversions have been constructed at the foot of upland slopes. The cropland in areas of Muscatine and Garwin soils on broad upland flats has been greatly improved because a drainage system, such as subsurface tile, has been installed.

Deficiencies in plant nutrients have been counteracted in some areas. Some soils are more productive than they were in their natural state because of applications of commercial fertilizer.

Relief

Relief is an important cause of differences among soils. It indirectly influences soil formation through its effect on drainage. In Cedar County the soils range from level to very steep. In many areas on bottom land, the nearly level soils are subject to occasional flooding and have a permanently or periodically high water table. In depressions, water soaks into the nearly level soils that are subject to flooding. Conversely, much of the rainfall runs off the steep soils on uplands.

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

Ansgar, Garwin, Maxfield, Maxmore, and Walford soils, which formed in areas where the water table is high, have a dominantly grayish subsoil. Ely, Franklin, Klinger, Klingmore, Nevin, and Muscatine soils formed in areas where the water table fluctuated and was periodically high. Lindley and other soils that formed in areas where the water table was deeper in the soil profile have a yellowish brown or strong brown subsoil. Garwin, Maxfield, and Maxmore soils formed under prairie grasses and have a high water table. They contain more organic matter in the surface layer than well drained soils that also formed under prairie grasses. Clay accumulates in the subsoil of Sperry and other soils that are in slight depressions or in nearly level areas. A large amount of water carries the clay particles downward. Sperry soils are locally known as “claypan” soils because they have a slowly permeable subsoil, in which the greatest amount of downward-moving clay has accumulated.

Lindley and similar soils, which formed in glacial till, have a wide range in slope and are on many kinds of slopes. In these soils, the depth to carbonates is shallowest where the slopes are steepest, are convex, or are most unstable.

Time

The length of time required for a soil to form ultimately affects the kind of soil that is formed. An older or more strongly developed soil has well defined genetic horizons. A less well defined soil does not exhibit genetic horizons or has only weakly defined ones. Most soils on bottom land that are subject to frequent flooding are weakly developed because they have not been in place long enough for distinct horizons to develop.

The resistance of soil material to weathering can modify the effect of time. Soils that formed in material resistant to weathering, such as quartz sand, do not change much with time. Chelsea and Sparta soils are examples.

The loess in which Downs, Fayette, and Tama soils formed is probably 12,000 to 30,000 years old. The Iowan surface beneath the loess developed between 21,000 and 16,500 years ago.

On the steeper soils, material is generally removed before a thick profile with strongly developed horizons has had time to develop. Even though the material has

been in place for a long time, the soil may be immature because much of the water runs off the slopes rather than through the soil profile. Bassett, Kenyon, and Lindley soils formed on recently dissected slopes of late Wisconsin age (Ruhe, 1956; Ruhe, 1959). These soils are no older than 11,000 to 14,000 years and are probably much younger.

In areas where buried organic material has been deposited by ice, water, or wind, the age of a landscape can be determined by a process called radiocarbon dating (Ruhe and others, 1957). Radiocarbon studies of wood fragments and organic matter in loess and glacial till have made it possible to determine the approximate ages of soils that formed in loess and glacial deposits in Iowa. In Cedar County, the loess is thickest in areas of the nearly level soils on stable upland divides. It is underlain by a Yarmouth-Sangamon paleosol that is on the Pre-Illinoian till surface. In many places below the stable uplands, an organic layer is at the base of the loess. Organic matter below the solum of loess soils in Wayne County, Iowa, had radiocarbon ages of 19,000 to 20,000 years.

Processes of Horizon Differentiation

Horizons are differentiated from each other when four basic kinds of changes take place. These changes are additions, removals, transfers, and transformations (Simonson, 1959). Each of these kinds of change affects many substances in the soils, such as organic matter, soluble salts, carbonates, sesquioxides, and silicate clay materials. Most of these processes tend to promote horizon differentiation, but some tend to offset or retard it. The processes and the resulting changes occur simultaneously in soils. The ultimate nature of the profile is governed by the balance of these changes within the soil.

An accumulation of organic matter generally is an early phase of horizon differentiation. It has been an important process in the differentiation of horizons in the soils of Cedar County. The amount of organic matter that has accumulated in the surface layer of the soils ranges from high to low. In some soils, as a result of erosion, the content of organic matter is now lower than it was in the past.

The removal of substances from parts of the soil profile is important in the differentiation of horizons. The downward movement of calcium carbonates and bases is an example. The upper part of the soils in Cedar County has been leached of calcium carbonate. Many soils have been leached to the extent that they are strongly acid or very strongly acid, even in the subsoil.

Phosphorus is removed from the subsoil by plant roots and transferred to the parts of the plant growing above ground. It is then returned to the surface layer in the plant residue. This process affects the form and distribution of phosphorus in the soil profile.

The translocation of silicate clay minerals is another important process. The clay minerals in the surface layer are carried downward in suspension by percolating water. They accumulate in the subsoil as fillings in pores and root channels and as clay films on the faces of the soil structural units. This process has affected many of the soils in the county. In other soils, however, the clay content of the surface layer is not markedly different from that of the underlying layer and other evidence of clay movement is minimal.

Another kind of transfer occurs when cracks form as a result of shrinking and swelling. Because of the cracks, some of the material from the surface layer is transferred to the lower parts of the profile. This transfer is minimal in most soils. It is most common in very clayey soils.

Transformations are physical and chemical. The weathering of soil particles to smaller sizes is an example of a transformation. The reduction of iron is another example. This process is called gleying. It occurs when the soil is saturated for long

periods. The soil contains enough organic matter for biological activity to take place during periods of saturation. Gleying is evidenced by ferrous iron and gray colors in the soil. It is characteristic of poorly drained soils, such as Garwin soils. The content of reductive extractable iron, or free iron, generally is lower in somewhat poorly drained soils, such as Muscatine soils. Another kind of transformation is the weathering of the primary apatite minerals in the parent material to secondary phosphorus compounds.

References

Anderson, J.D. 1986. The archaeology of Coralville Lake, Iowa. Volume II: Landscape evolution. Great Lakes Archaeological Research Center Report of Investigations 167.

Arnold, R.W. 1965. Multiple working hypotheses in soil genesis. Soil Science Society of America Proceedings 29: 717-725.

Bettis, E.A. III. 1989. Late Quaternary history of the Iowa River valley in the Coralville Lake area. *In* Geologic Reconnaissance of the Coralville Lake Area, O.W. Plocher, editor. Geological Society of Iowa Guidebook 51, pages 93-100.

Bettis, E.A. III, and W.J. Autin. 1997. Complex response of a midwestern USA drainage system to late Wisconsinan sedimentation. Journal of Sedimentary Research 67(4): 740-748.

Boellstorff, J. 1978a. Chronology of some late Cenozoic deposits from the central United States and the ice ages. Transactions of the Nebraska Academy of Science 6: 35-49.

Boellstorff, J. 1978b. North American Pleistocene stages reconsidered in light of probable Pliocene-Pleistocene continental glaciation. Science 202: 305-307.

Calvin, Samuel. 1897. Geology of Johnson County. Iowa Geological Survey Annual Report 7: 32-116.

Esling, S.P. 1984. Quaternary stratigraphy of the lower Iowa and Cedar River valleys, southeast Iowa. Ph.D. dissertation, University of Iowa.

Hallberg, G.R. 1980a. Illinoian and Pre-Illinoian stratigraphy of southeast Iowa and adjacent Illinois. Iowa Geological Survey Technical Information Series 11.

Hallberg, G.R. 1980b. Pleistocene stratigraphy in east-central Iowa. Iowa Geological Survey Technical Information Series 10.

Hallberg, G.R. 1986. Pre-Wisconsin glacial stratigraphy of the central plains region in Iowa, Nebraska, Kansas, and Missouri. *In* Quaternary Glaciations in the United States of America, edited by G.M. Richmond and D.S. Fullerton, pages 11-15, Report of the International Correlation Programme-Project 24. Volume 5 of Quaternary Science Reviews, Quaternary Glaciations in the Northern Hemisphere, edited by V. Sibrava, D.Q. Bowen, and G.M. Richmond.

Hallberg, G.R., T.E. Fenton, G.A. Miller, and A.J. Lutenegger. 1978. The Iowan Erosion Surface: An old story, an important lesson, and some new wrinkles. *In* 42nd Annual Tri-State Geological Field Conference Guidebook, edited by R. Anderson, pages 2-1 to 2-94.

Hutton, Curtis E. 1947. Studies of loess-derived soils in southwestern Iowa. Soil Science Society of America Proceedings 21: 232-235.

Jenny, Hans. 1941. Factors of soil formation.

Kay, George F., and E.T. Apfel. 1929. The Pre-Illinoian Pleistocene geology of Iowa. Iowa Geological Survey Annual Report 34.

Lane, G.H. 1941. Pollen analysis of interglacial peats of Iowa. Iowa Geological Survey Annual Report 37: 237-260.

Miller, G.A. 1974. Soil parent material stratigraphy and soil development, Cedar County, Iowa. Ph.D. dissertation, Iowa State University.

Minger, M.J. 1991. Soil survey of Jones County, Iowa. U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the Iowa Agricultural Experiment Station.

Prill, R.C., and F.F. Riecken. 1958. Variations in forest-derived soils formed in Kansan till in southern and southeastern Iowa. Soil Science Society of America Proceedings 22: 70-75.

Prior, J.C. 1976. A regional guide to Iowa landforms. Iowa Geological Survey Educational Bulletin 3.

Ruhe, R.V. 1956. Geomorphic surfaces and the nature of soils. Soil Science 82: 441-445.

Ruhe, R.V. 1959. Stone lines in soils. Soil Science 87: 223-231.

Ruhe, R.V. 1969. Quaternary landscapes in Iowa. Iowa State University Press.

Ruhe, R.V., and R.B. Daniels. 1958. Soils, paleosols, and soil horizon nomenclature. Soil Science Society of America Proceedings 22: 66-69.

Ruhe, R.V., W.P. Dietz, T.E. Fenton, and G.F. Hall. 1968. Iowan drift problem in northeastern Iowa. Iowa Geological Survey Report of Investigations 7.

Ruhe, R.V., and J.C. Prior. 1970. Pleistocene Lake Calvin, eastern Iowa. Geological Society of America Bulletin 81: 919-924.

Ruhe, R.V., M. Rubin, and W.H. Scholtes. 1957. Late Pleistocene radiocarbon chronology in Iowa. American Journal of Science 255: 671-689.

Ruhe, R.V., and W.H. Scholtes. 1955. Radiocarbon dates in central Iowa. Journal of Geology 63: 82-92.

Ruhe, R.V., and P.H. Walker. 1968. Hillslope models and soil formation: I, Open systems. Transactions of the 9th International Congress of Soil Science, Adelaide, Australia, volume 4, pages 551-560.

Schermerhorn, E.J. 1983. Soil survey of Johnson County, Iowa. U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the Iowa Agricultural Experiment Station.

Schermerhorn, E.J., L.I. Harmon, F.F. Riecken, and T.E. Fenton. 1979. Soil survey of Cedar County, Iowa. U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the Iowa Agriculture and Home Economics Experiment Station, the Cooperative Extension Service of Iowa State University, and the Department of Soil Conservation, State of Iowa.

Schoewe, W.H. 1920. The origin and history of extinct Lake Calvin. Iowa Geological Survey Annual Report 29: 49-222.

Scholtes, W.H. 1955. Properties and classification of the paha loess-derived soils in northeastern Iowa. Iowa State College Journal of Science 30: 163-209.

Simonson, Roy W. 1959. Outline of a generalized theory of soil genesis. Soil Science Society of America Proceedings 23: 152-156.

Simonson, Roy W., F.F. Riecken, and G.D. Smith. 1952. Understanding Iowa soils.

Smith, Guy D., W.H. Allaway, and F.F. Riecken. 1950. Prairie soils of the Upper Mississippian Valley. Advances in Agronomy 2: 157-205.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. [http://soils.usda.gov/technical/]

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Steckly, S.R. 2007. Soil survey of Iowa County, Iowa. U.S. Department of Agriculture, Natural Resources Conservation Service, in cooperation with the Iowa Agriculture and Home Economics Experiment Station and Cooperative Extension Service of Iowa State University and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship.

United States Department of Agriculture. 2006. Iowa agricultural statistics. National Agricultural Statistics Service.

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. [http://soils.usda.gov/]

United States Department of Commerce, Bureau of the Census. 2002. Census of agriculture.

Walters, J.C. 1996. General and environmental geology of the Cedar Falls/Waterloo area, the Iowan Surface. *In* General and Environmental Geology of Cedar Falls/Waterloo and Surrounding Area, Northeast Iowa. Iowa Geological Survey Guidebook Series, number 22, pages 7-9.

Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the "National Soil Survey Handbook" (available in local offices of the Natural Resources Conservation Service or on the Internet).

Ablation till. Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

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. Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl. A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction toward which a slope faces. Also called slope aspect.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope (fig. 15). In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Basal till. Compact till deposited beneath the ice.

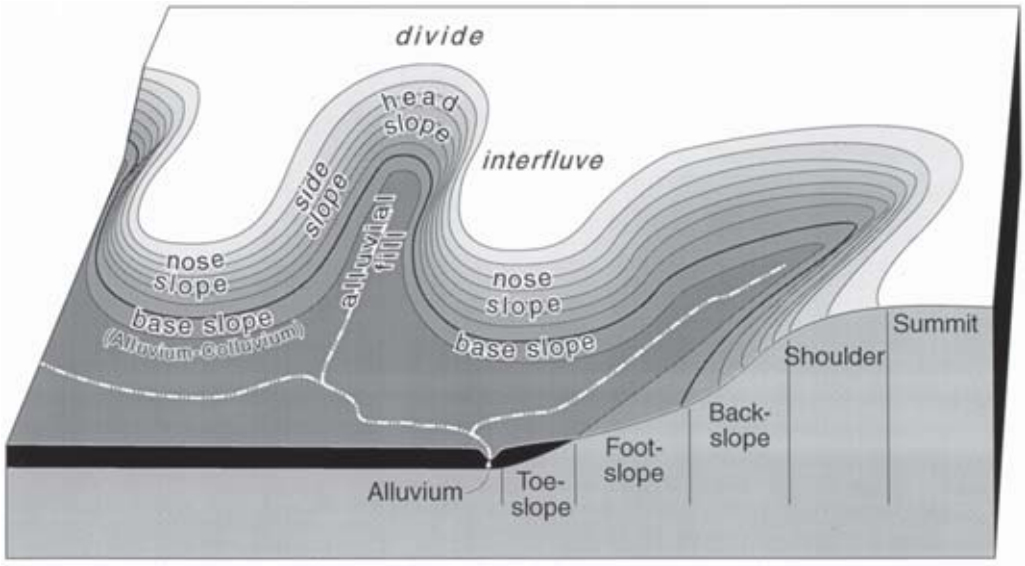

Figure 15.—Landscape relationship of geomorphic components and hillslope positions (modified after Ruhe and Walker, 1968).

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology). A geomorphic component of hills (fig. 15) consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Beach deposits. Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a post-glacial or glacial lake.

Bedding plane. A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed; the adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Bottom land. An informal term loosely applied to various portions of a flood plain.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

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 and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. See Terracettes.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) 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 shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. See Redoximorphic features.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A dense, compact, slowly permeable subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 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 has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them

separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. See Redoximorphic features.

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 effects of 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. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology). A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations). Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops according to a planned system of rotation and management practices.

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.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delta. A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divide. (a) The line of separation, or (b) the summit area, or narrow tract of higher ground that constitutes the watershed boundary between two adjacent drainage basins (fig. 15); it divides the surface waters that flow naturally in one direction from those that flow in the opposite direction.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Drift. A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

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.

Earthy fill. See Mine spoil.

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 deposit. Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further 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. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Esker. A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has 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. The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms. A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay. A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step. An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial. Of or pertaining to rivers or streams; produced by stream or river action.
Footslope. The concave surface at the base of a hillslope (fig. 15). A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).
Forb. Any herbaceous plant not a grass or a sedge.
Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.
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.
Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.
Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.
Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.
Graded stripcropping. Growing crops in strips that grade toward a protected waterway.
Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.
Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.
Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.
Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.
Ground water. Water filling all the unblocked pores of the material below the water table.
Gully. A small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. 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.
Hard to reclaim (in tables). Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.
Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.
Head slope (geomorphology). A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway (fig. 15). The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-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 generic term for an elevated area 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. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope. A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill (fig. 15).

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. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

L horizon.—A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

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 that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology). A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill (fig. 15); shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream. A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron depletions. See Redoximorphic features.

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 low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

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). A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Ksat. Saturated hydraulic conductivity.

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.

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. A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. 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.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

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. Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength. The soil is not strong enough to support loads.

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.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Masses. See Redoximorphic features.

Meander belt. The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar. A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll. One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

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 at depth in the earth's crust. Nearly all such rocks are crystalline.

Mine spoil. An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

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. A kind of map unit that has little or no natural soil and supports little or no vegetation.

MLRA (major land resource area). A geographic area characterized by a particular pattern of land uses, elevation and topography, soils, climate, water resources, and potential natural 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. In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties

of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. See Redoximorphic features.

Nose slope (geomorphology). A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside (fig. 15). The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

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. Stratified and sorted sediments (chiefly sand and gravel) removed or "washed out" from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain. An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace. An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Parts per million (ppm). The concentration of a substance in the soil, such as phosphorus or potassium, in one million parts of air-dried soil on a weight per weight basis.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

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.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. (See Saturated hydraulic conductivity.)

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Phosphorus. The amount of phosphorus available to plants at a depth of 30 to 42 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available phosphorus are:

Very low	less than 7.5 ppm
Low	7.5 to 13.0 ppm
Medium	13.0 to 22.5 ppm
High	more than 22.5 ppm

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.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology). A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

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.

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.

Pore linings. See Redoximorphic features.

Potassium. The amount of potassium available to plants at a depth of 12 to 24 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available potassium are:

Very low	less than 50 ppm
Low	50 to 79 ppm
Medium	79 to 125 ppm
High	more than 125 ppm

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

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 as 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:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. See Redoximorphic features.

Redoximorphic depletions. See Redoximorphic features.

Redoximorphic features. Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric

layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*

B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*

C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.

2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:

A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*

B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).

3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix. See Redoximorphic features.

Regolith. All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief. The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill. A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser. The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

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.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (Ksat). The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy's Law, a

law that describes the rate of water movement through porous media. Commonly abbreviated as "Ksat." Terms describing saturated hydraulic conductivity are very high, 100 or more micrometers per second (14.17 or more inches per hour); high, 10 to 100 micrometers per second (1.417 to 14.17 inches per hour); moderately high, 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour); moderately low, 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour); low, 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour); and very low, less than 0.01 micrometer per second (less than 0.001417 inch per hour). To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

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. A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

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. All the soils of a given series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

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 convex, erosional surface near the top of a hillslope (fig. 15). A shoulder is a transition from summit to backslope.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope (geomorphology). A geomorphic component of hills consisting of a laterally planar area of a hillside (fig. 15). The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

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. An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

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 closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Slickensides (pedogenic). Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

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.

Slope alluvium. Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

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 and by the passage 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 material below the solum. 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. In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

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.

Strath terrace. A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subglacial. Formed or accumulated in or by the bottom parts of a glacier or ice sheet.

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 a hardpan or claypan.

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 (fig. 15). It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Swale. A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine caused by uneven glacial deposition.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine. An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation). 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 generally is 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 (geomorphology). A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes. Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

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.”

Till. Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.

Till plain. An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The gently inclined surface at the base of a hillslope (fig. 15). Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

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.

Tread. The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Upland. An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill. The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer 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 disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth's surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

NRCS Accessibility Statement

The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.