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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 Adams 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 2006. Soil names and descriptions were approved in 2007. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2006. 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; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship. The survey is part of the technical assistance furnished to the Adams 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 pond in an area of the Ladoga-Gara association provides erosion control and a source of water for livestock.

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 2008

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.

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.

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Soil Survey of
Adams County, Iowa

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Adams County is in southwestern Iowa (fig. 1). It is in the second tier of counties north of the Iowa-Missouri state line and is the third county east of the Missouri River. It has an area of 272,700 acres, or about 425 square miles. Corning, the county seat, is approximately 70 miles southwest of Des Moines, Iowa.

This soil survey updates the survey of Adams County, Iowa, published in 1963 (Dideriksen, 1963). 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 Area 108, the Illinois and Iowa Deep Loess and Drift. 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). Adams County is a subset of MLRA 108. In some cases in this survey, a soil may be referred to that was not mapped specifically in Adams County but that does occur within MLRA 108.

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.

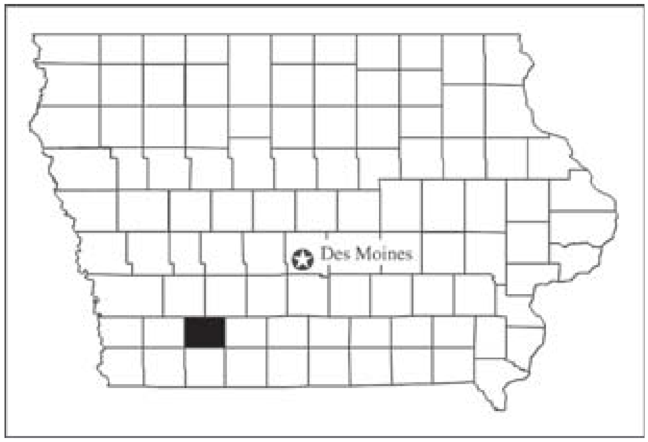

Figure 1.—Location of Adams County in Iowa.

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 high 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; industry, transportation facilities, and recreation; physiography and drainage; and climate.

History

Adams County is centrally located in the southwest quarter of Iowa, along the Nodaway River. The land was originally acquired from the French as part of the Louisiana Purchase of 1803. Adams County officially became recognized as a county by the State Legislature in 1853. At that time the county had 36 townships. Its original size was later reduced with the creation of Union and Montgomery Counties (Travis and others, 1984).

Early settlers of Adams County, mostly from Missouri, traveled up the divides leading north and south. They followed the rich valley of the Nodaway River, where timber and game were abundant. As they settled, agriculture became the main industry. Most businesses established in the county were related to the farming community.

The first county seat was established by a legislative act in 1853. The town was named Quincy for John Quincy Adams; the county was also named in his honor. The county seat was moved to Corning in 1872 (Travis and others, 1984).

In 1848, a group of French Icarians led by Etienne Cabet immigrated to New Orleans, Louisiana (Wikipedia article, “Corning, Iowa,” December 2007). This group was made up of many talented and well educated people whose main purpose was to create an egalitarian community where there was no money, no private property, no courts of law, no secret police, and no crime (French Icarian Colony Foundation, 2007). All members in the group worked for the common good of the community.

After immigrating from France to New Orleans, the Icarians applied for citizenship and migrated to the Dallas, Texas, area. After disease and fever ravaged the group, some returned to New Orleans and the rest moved to Nauvoo, Illinois, after the Mormons left Nauvoo for Salt Lake City, Utah (French Icarian Colony Foundation, 2007).

In 1860, 235 members of that group bought nine sections of land in Adams County, Iowa, and received a corporate charter from the State of Iowa for the newly named town Icaria. The colony was located 4 miles east of Corning, north of the present-day Highway 34. The structures they built were placed in a parallelogram around a central dining hall and recreation hall (Wikipedia article, "Corning, Iowa," December 2007).

The colony served as a major supply depot for early westward immigrants, including Mormons who crossed Iowa from Nauvoo, Illinois, to Salt Lake City, Utah, to purchase supplies. The U.S. Army also relied upon the colony as a source for wool, horses, meat, oats, and other supplies. The settlement also was a stop on one of the early mail routes across Iowa. The colony dissolved in 1898, and three buildings and a cemetery are the only evidence left of this colony today.

Coal was discovered in Adams County around the Carbon area in the early 1870s. It was a poor quality, high sulfur bituminous coal, which typically sold for $2 to $3 per ton. The coal provided a cheap energy source for heating homes in Adams County and the surrounding counties. Mines were located primarily around the town of Carbon, near Buck Creek, and near the Middle Nodaway River in Adams County (fig. 2).

The first coal mines used a round shaft that ranged from 25 to 45 feet deep (Hauck, 2005). Later, rectangular shafts, curbed with logs and milled lumber, were used, and the shafts extended to depths of as much as 175 feet. Originally, the coal was removed from the shafts by horses connected to a large bucket. Later, a cage replaced the buckets and was used to hoist a car containing 800 pounds of coal out of the shaft. In the early 1930s, gas engines replaced horses as the power source for raising coal out of the mines (Hauck, 2005).

Coal miners worked in areas called long rooms. A long room is a large rectangular area with no support columns. Most miners did their work in spaces 24 to 28 inches wide. The coal seams themselves were 12 to 16 inches in thickness. When the coal

Figure 2.—This shale spoil pile is a reminder that coal mines were once common in the western part of Adams County.

seams were loosened, layers of shale and limestone had to be separated from the coal before it could be brought to the surface (Hauck, 2005).

Revenue from the coal mines provided a boon to the area around the Middle Nodaway River during the Depression era of the 1930s. Coal miners could easily earn anywhere from $3 to as much as $6 per day, compared to farm laborers, who were usually paid $1 per day. Today, the population of Carbon is 44. During the Depression, there were about 350 people, mainly because of the thriving coal business of that period. Coal mining declined rapidly during World War II, and the last coal mine closed in 1950 (Hauck, 2005).

In 1900, there were 13,601 people in Adams County. The county's population decreased from 8,753 in 1950 to 4,482 in the year 2000 (Wikipedia article, "Adams County, Iowa," 2007). Corning, the largest city in the county, has a population of 1,783 (Wikipedia article, "Corning, Iowa," February 2007).

Industry, Transportation Facilities, and Recreation

Agriculture is the primary industry and the dominant land use in Adams County (fig. 3). Corn and soybean production and livestock operations have replaced prairie grasses and native timber. In 2006, cropland or pasture covered 235,000 acres, or 86 percent of the county (USDA, 2007). Currently, the average farm size is 420 acres; in 1975, the average farm size was 340 acres (USDA, 2007). Although the farm size has increased, the number of farms and the varieties of crops have decreased. Principal cropland harvested represented 54 percent (146,940 acres) of the land use in Adams County (USDA, 2007). Corn and soybeans are the major row crops, with harvested corn accounting for 43 percent of the total harvested cropland and soybeans accounting for 41 percent (USDA, 2007). The remaining 16 percent of the total harvested cropland includes oats, wheat, alfalfa hay, and other hay crops (USDA, 2007).

Farming practices also have changed over the years. In 2006, Adams County farmers planted 57,000 acres of no-till corn and soybeans (Sprague, 2006). Farm animals marketed in 2002 included 25,256 hogs and pigs and 31,926 head of cattle (fig. 4) (USDA, 2007). Other industries include manufacturing applications, educational services, medical and mental health groups, and other service-oriented businesses. Mining and mineral resources are minimal.

Transportation facilities include highways, railroads, and an airport. Interstate 80 is about 40 miles from Corning. State Highway 148 bisects the center of the county in a north-to-south direction. State Highway 34 crosses the center of the county from east to west. Freight is transported by truck or by railroad. Corning Municipal Airport is 2 miles west of Corning.

Adams County offers 2,128 acres of parks and wildlife areas. The Hamilton, Hoskinson, and Talty wildlife areas total 183 acres. Lake Icaria Park, the only county recreation park, has a total of 1,945 acres, of which 650 acres is water (Iowa HomeTownLocator Online, 2007).

Physiography and Drainage

The original topography of the survey area was that of a glacial drift plain. This glacial drift plain was greatly modified by downcutting of streams and geologic erosion. The remnants of the plain now occupy a series of stable loess-covered divides that run throughout the county. These divides are gently sloping to moderately sloping in nearly all parts of the county and are less than $^{1}/_{8}$ mile in width. In the southeastern part of the survey area, the stable summits become flatter, are nearly level and gently sloping, and are generally $^{1}/_{4}$ mile to 1$^{1}/_{4}$ miles wide. These divides

Figure 3.—Terraces and grassed waterways are common in Adams County, where agriculture is the dominant land use. Pictured is an area of Sharpsburg, Lamoni, and Shelby soils.

Figure 4.—Beef cattle grazing in an area of improved pasture on Gara and Ladoga soils.

are bordered by moderately sloping and strongly sloping, loess-covered side slopes at the upper end of the drainageways.

Below the loess-covered summits are moderately sloping and strongly sloping areas of developed paleosols. Below the paleosol are strongly sloping and moderately steep areas of less developed glacial till soils (fig. 5). The nearly level and level flood plains range from $^{1}/_{8}$ mile to $1^{1}/_{4}$ miles wide.

The highest elevation in the survey area, 1,320 feet above sea level, is in the northern part of the county adjacent to Cass County. The elevation of the upland divides decreases toward the southwest in the southern part of the county. The lowest elevation, about 1,050 feet above sea level, is at the point where the East Nodaway River leaves the county just south of the town of Nodaway. The smaller stream valleys are commonly 80 to 180 feet in elevation below the upland divides.

All of Adams County is in the Missouri River watershed. The western part of the county is drained by the Middle and East Nodaway Rivers. The south-central part of the county is drained by the Hundred and Two River, and the eastern part of the county is drained by the Platte River. Streams flow generally toward the south or southwest.

Water movement in soils varies depending on natural drainage properties. The loess soils of the level or nearly level upland divides are somewhat poorly drained and poorly drained. Loess soils of the gently sloping upland ridges are moderately well drained and somewhat poorly drained. The moderately sloping loess soils range from poorly drained to moderately well drained. The paleosols are poorly drained or somewhat poorly drained. Sidehill seeps occur between the moderately sloping loess soils and the paleosols. These seeps are caused by rainwater that infiltrates through the loess soils and perches at the point where the loess comes in contact with the less permeable paleosol. The perched water flows laterally until it reaches the point where the contact between loess and till is exposed at the surface. Installing interceptor tile in the loess soils slightly upslope from these wet, seepy areas helps to intercept and drain excess moisture.

The strongly sloping to steep soils that formed in till are well drained. Generally, soils on the flood plains are poorly drained to moderately well drained and are subject to flooding and ponding. Tile drainage systems may not function satisfactorily in some soils that have a slowly permeable subsoil or in areas that have inadequate tile outlets. Generally, tile is supplemented by a good surface drainage system to provide adequate drainage in areas of these soils.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Corning, Iowa, in the period 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 length of the growing season.

In winter, the average temperature is 23.5 degrees F and the average daily minimum temperature is 13.1 degrees. The lowest temperature on record, which occurred on January, 1912, is -32 degrees. In summer, the average temperature is 72.1 degrees and the average daily maximum temperature is 83.9 degrees. The highest recorded temperature, which occurred on July, 25, 1936, is 115 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 total annual precipitation is about 35.9 inches. Of this total, 22.1 inches, or 62 percent, usually falls in May through September. The growing season for most crops

Figure 5.—Shelby soils formed in pre-Illinoian till under prairie grass vegetation. Note the calcium carbonate masses at a depth of 1 meter.

falls within this period. In 2 years out of 10, the rainfall in April through September is less than 12 inches. The heaviest 1-day rainfall on record was 8 inches at Corning on August 27, 1903. Thunderstorms occur on about 47 days each year, and most occur in June.

The average seasonal snowfall is 24.6 inches. The greatest recorded snow depth at any one time was 29 inches on March 14, 1912. The heaviest 1-day snowfall on record was more than 16 inches, recorded on January 12, 1942. On the average, 14 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 83 percent. The sun shines 71 percent of the time possible in summer and 52 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 11.7 miles per hour, in April.

Table 1.--Temperature and Precipitation

(Recorded in the period 1971-2000 at Corning, 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----	30.7	9.6	20.1	58	-22	0	0.92	0.25	1.52	2	5.9
February---	36.6	14.9	25.7	69	-19	1	1.01	.38	1.49	2	5.9
March------	48.7	25.8	37.3	80	-2	24	2.35	.70	3.99	5	3.3
April------	61.4	37.0	49.2	87	16	110	3.47	1.70	4.84	6	1.2
May--------	72.0	48.1	60.1	89	30	323	4.55	2.42	6.44	8	.0
June-------	81.6	58.0	69.8	97	41	592	4.51	2.47	6.42	7	.0
July-------	86.0	62.6	74.3	99	47	747	4.52	1.82	7.01	6	.0
August-----	84.1	60.1	72.1	99	44	671	4.12	1.71	5.87	5	.0
September--	76.5	50.8	63.6	94	29	417	4.40	1.87	6.36	5	.0
October----	64.6	38.9	51.8	88	18	148	2.63	1.14	4.10	4	.2
November---	47.7	26.4	37.0	74	3	16	2.20	.85	3.45	4	2.3
December---	34.4	14.8	24.6	63	-15	1	1.19	.48	1.87	3	5.8
Yearly:											
Average---	60.4	37.2	48.8	---	---	---	---	---	---	---	---
Extreme---	106	-32	---	101	-24	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,050	35.87	27.64	43.15	57	24.6

* 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 Corning, 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. 21	Apr. 27	May 8
2 years in 10 later than--	Apr. 16	Apr. 22	May 4
5 years in 10 later than--	Apr. 7	Apr. 14	Apr. 26
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 4	Sept. 26	Sept. 17
2 years in 10 earlier than--	Oct. 11	Oct. 1	Sept. 23
5 years in 10 earlier than--	Oct. 24	Oct. 11	Oct. 4

Table 3.--Growing Season

(Recorded in the period 1971-2000 at Corning, 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	176	161	141
8 years in 10	184	167	147
5 years in 10	199	179	159
2 years in 10	214	192	171
1 year in 10	222	198	177

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. Sharpsburg-Macksburg Association (fig. 6)

Extent of the association in the survey area: 16 percent

Component Description

Sharpsburg
Extent: 40 percent of the unit
Position on the landform: Hillslopes and treads and risers on stream terraces
Slope range: 0 to 14 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
Flooding: None
Shallowest depth to wet zone: 4.0 feet
Deepest depth to wet zone: 6.5 feet
Ponding: None
Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 3.4 percent

Macksburg
Extent: 17 percent of the unit
Position on the landform: Upland flats and slight rises
Slope range: 0 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
Deepest depth to wet zone: 4.0 feet
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 4.6 percent

Soils of Minor Extent

Lamoni and similar soils
Extent: 12 percent of the association

Zook and similar soils
Extent: 10 percent of the association

Clearfield and similar soils
Extent: 10 percent of the association

Clarinda and similar soils
Extent: 8 percent of the association

Shelby and similar soils
Extent: 3 percent of the association

2. Sharpsburg-Shelby Association (fig. 7)

Extent of the association in the survey area: 58 percent

Component Description

Sharpsburg
Extent: 44 percent of the unit
Position on the landform: Hillslopes and treads and risers on stream terraces
Slope range: 0 to 14 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
Flooding: None
Shallowest depth to wet zone: 4.0 feet
Deepest depth to wet zone: 6.5 feet
Ponding: None
Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 3.4 percent

Shelby, moderately eroded
Extent: 19 percent of the unit
Position on the landform: Hillslopes
Slope range: 5 to 25 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained

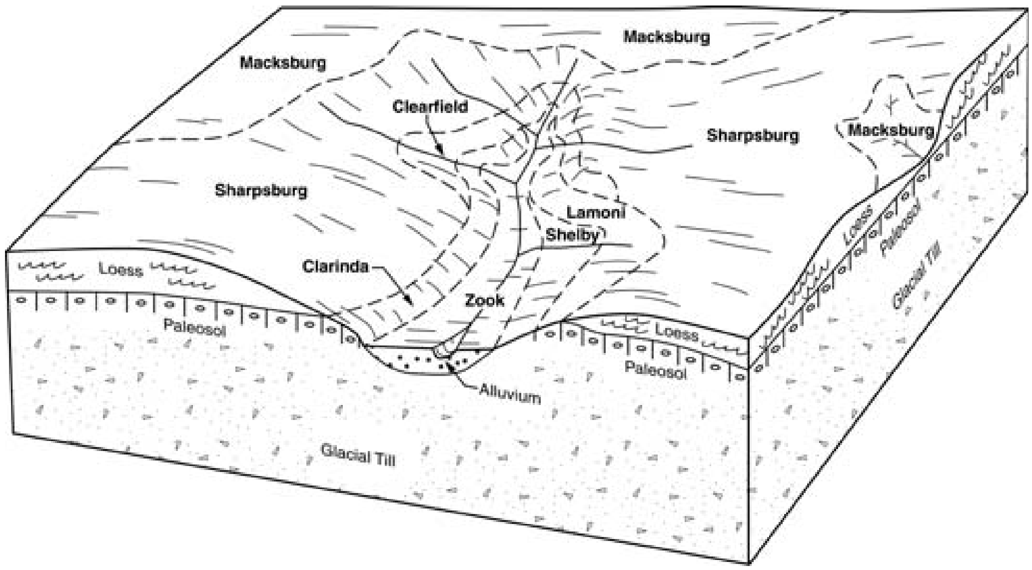

Figure 6.—Typical pattern of soils and parent material in the Sharpsburg-Macksburg association.

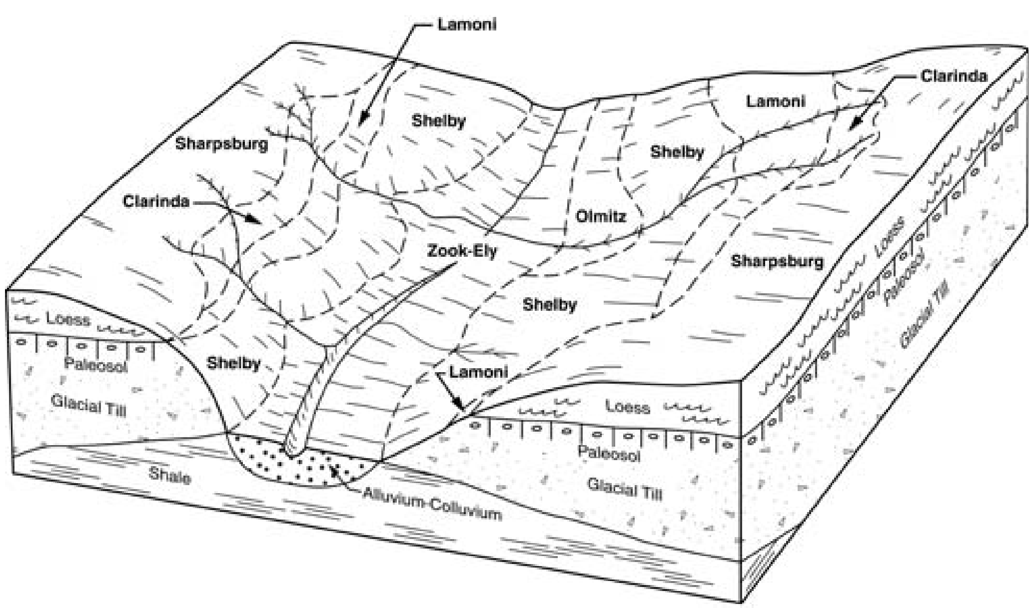

Figure 7.—Typical pattern of soils and parent material in the Sharpsburg-Shelby association.

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: 10.0 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Soils of Minor Extent

Lamoni and similar soils
Extent: 10 percent of the association

Ely and similar soils
Extent: 9 percent of the association

Zook and similar soils
Extent: 7 percent of the association

Clarinda and similar soils
Extent: 7 percent of the association

Olmitz and similar soils
Extent: 4 percent of the association

3. Ladoga-Gara Association (fig. 8)

Extent of the association in the survey area: 17 percent

Component Description

Ladoga
Extent: 39 percent of the unit
Position on the landform: Hillslopes and treads and risers on stream terraces
Slope range: 1 to 14 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
Flooding: None
Shallowest depth to wet zone: 4.0 feet
Deepest depth to wet zone: 6.5 feet
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Gara, moderately eroded
Extent: 30 percent of the unit
Position on the landform: Hillslopes
Slope range: 5 to 40 percent
Texture of the surface layer: Clay 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

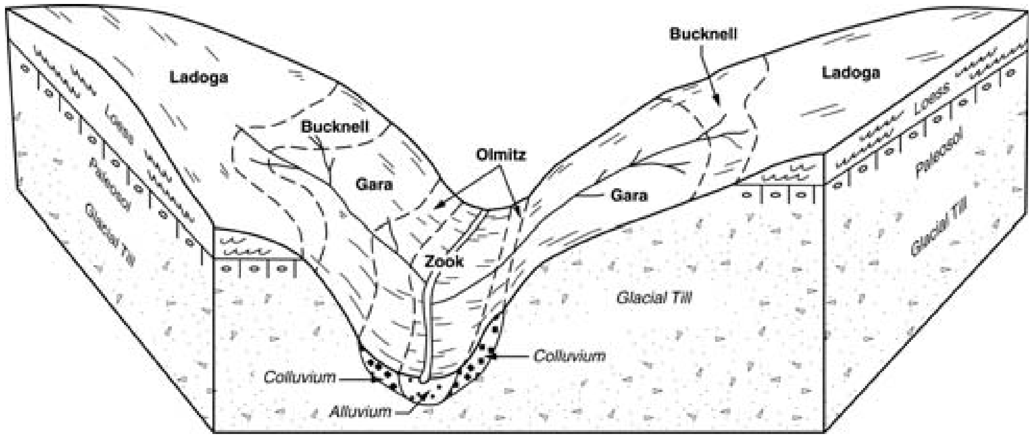

Figure 8.—Typical pattern of soils and parent material in the Ladoga-Gara association.

Ponding: None
Available water capacity to a depth of 60 inches: 9.8 inches
Content of organic matter in the upper 10 inches: 1.5 percent

Soils of Minor Extent

Bucknell and similar soils
Extent: 10 percent of the association

Ely and similar soils
Extent: 9 percent of the association

Zook and similar soils
Extent: 8 percent of the association

Olmitz and similar soils
Extent: 4 percent of the association

4. Zook-Nodaway Association (fig. 9)

Extent of the association in the survey area: 9 percent

Component Description

Zook
Extent: 60 percent of the unit
Position on the landform: Flood plains
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: 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

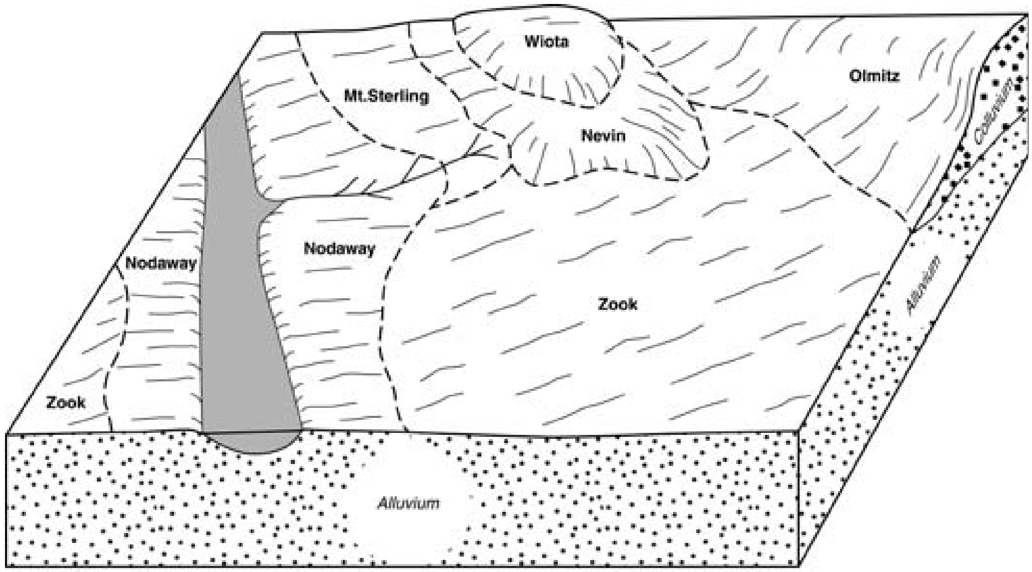

Figure 9.—Typical pattern of soils and parent material in the Zook-Nodaway association.

Deepest depth to wet zone: 3.0 feet
Ponding: None
Available water capacity to a depth of 60 inches: 10.7 inches
Content of organic matter in the upper 10 inches: 6.0 percent

Nodaway
Extent: 16 percent of the unit
Position on the landform: 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: 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
Deepest depth to wet zone: 6.5 feet
Ponding: None
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 1.5 percent

Soils of Minor Extent

Olmitz and similar soils
Extent: 8 percent of the association

Mt. Sterling and similar soils
Extent: 5 percent of the association

Ely and similar soils
Extent: 4 percent of the association

Nevin and similar soils
Extent: 4 percent of the association

Wiota and similar soils
Extent: 3 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 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, Ladoga silt loam, 9 to 14 percent slopes, moderately eroded, is a phase of the Ladoga 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. Macksburg-Nira 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, limestone quarries, 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.

7—Wiota silty clay loam, 0 to 2 percent slopes, rarely flooded

Component Description

Wiota, rarely flooded, and similar soils
Extent: 80 to 90 percent of the unit
Position on the landform: 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: Moderately well drained
Parent material: 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: 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: 12.2 inches
Content of organic matter in the upper 10 inches: 3.9 percent

Minor Dissimilar Components

Nevin, rarely flooded, and similar soils
Extent: 10 to 20 percent of the unit

7B—Wiota silty clay loam, 2 to 5 percent slopes, rarely flooded

Component Description

Wiota, rarely flooded, and similar soils
Extent: 80 to 90 percent of the unit
Position on the landform: 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: Moderately well drained
Parent material: 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: 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: 12.2 inches
Content of organic matter in the upper 10 inches: 3.9 percent

Minor Dissimilar Components

Nevin, rarely flooded, and similar soils
Extent: 10 to 20 percent of the unit

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

Component Description

Judson and similar soils
Extent: 75 to 95 percent of the unit
Position on the landform: 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: 3.5 percent

Minor Dissimilar Components

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

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

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

15B—Olmitz-Ely-Zook complex, 2 to 5 percent slopes

Component Description

Olmitz and similar soils
Extent: 15 to 55 percent of the unit
Position on the landform: Footslopes and alluvial fans along upland drainageways
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 local alluvium derived from 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: 9.6 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Ely and similar soils
Extent: 25 to 35 percent of the unit
Position on the landform: Footslopes and alluvial fans 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: 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: 12.1 inches
Content of organic matter in the upper 10 inches: 5.3 percent

Zook and similar soils
Extent: 15 to 25 percent of the unit
Position on the landform: 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: 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)
Ponding: None
Available water capacity to a depth of 60 inches: 10.7 inches
Content of organic matter in the upper 10 inches: 6.0 percent

Minor Dissimilar Components

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

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

16—Nodaway-Kennebec complex, 0 to 2 percent slopes, occasionally flooded

Component Description

Nodaway, occasionally flooded, and similar soils
Extent: 45 to 65 percent of the unit
Position on the landform: 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: 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: 12.7 inches
Content of organic matter in the upper 10 inches: 1.5 percent

Kennebec, occasionally flooded, and similar soils
Extent: 30 to 40 percent of the unit
Position on the landform: 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: 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: 12.2 inches
Content of organic matter in the upper 10 inches: 4.9 percent

Minor Dissimilar Components

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

24C2—Shelby clay loam, 5 to 9 percent slopes, moderately eroded

Component Description

Shelby, moderately eroded, and similar soils
Extent: 75 to 95 percent of the unit
Position on the landform: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Clay 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: 10.0 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

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

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

24D2—Shelby clay loam, 9 to 14 percent slopes, moderately eroded

Component Description

Shelby, moderately eroded, and similar soils
Extent: 60 to 80 percent of the unit
Position on the landform: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Clay 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: 10.0 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

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

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

Lamoni, slightly eroded, and similar soils
Extent: 0 to 10 percent of the unit

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

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

24E—Shelby clay loam, 14 to 18 percent slopes

Component Description

Shelby and similar soils
Extent: 40 to 80 percent of the unit
Position on the landform: Side slopes
Slope range: 14 to 18 percent
Texture of the surface layer: Clay 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: 9.8 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Minor Dissimilar Components

Shelby, moderately eroded, and similar soils
Extent: 15 to 35 percent of the unit

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

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

24E2—Shelby clay loam, 14 to 18 percent slopes, moderately eroded

Component Description

Shelby, moderately eroded, and similar soils
Extent: 45 to 85 percent of the unit
Position on the landform: Side slopes
Slope range: 14 to 18 percent
Texture of the surface layer: Clay 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: 10.0 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

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

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

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

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

24F—Shelby clay loam, 18 to 25 percent slopes

Component Description

Shelby and similar soils
Extent: 50 to 80 percent of the unit
Position on the landform: Side slopes
Slope range: 18 to 25 percent
Texture of the surface layer: Clay 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: 9.8 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Minor Dissimilar Components

Shelby, moderately eroded, and similar soils
Extent: 10 to 20 percent of the unit

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

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

43—Bremer silty clay loam, 0 to 2 percent slopes, rarely flooded

Component Description

Bremer, rarely flooded, and similar soils
Extent: 75 to 95 percent of the unit
Position on the landform: 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: 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: 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: 6.0 percent

Minor Dissimilar Components

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

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

45B—Zook-Ely complex, 2 to 5 percent slopes

Component Description

Zook and similar soils
Extent: 65 to 85 percent of the unit
Position on the landform: 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: 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)
Ponding: None
Available water capacity to a depth of 60 inches: 10.7 inches
Content of organic matter in the upper 10 inches: 6.0 percent

Ely and similar soils
Extent: 15 to 25 percent of the unit
Position on the landform: Footslopes and alluvial fans 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: 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: 12.1 inches
Content of organic matter in the upper 10 inches: 5.3 percent

Minor Dissimilar Components

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

54—Zook silty clay loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Zook, occasionally flooded, and similar soils
Extent: 80 to 100 percent of the unit
Position on the landform: Flood plains
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: 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: 10.7 inches
Content of organic matter in the upper 10 inches: 6.0 percent

Minor Dissimilar Components

Zook, occasionally flooded, overwash, and similar soils
Extent: 0 to 20 percent of the unit

54+—Zook silt loam, 0 to 2 percent slopes, occasionally flooded, overwash

Component Description

Zook, occasionally flooded, overwash, and similar soils
Extent: 55 to 95 percent of the unit
Position on the landform: 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: 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: 13.0 inches
Content of organic matter in the upper 10 inches: 3.0 percent

Minor Dissimilar Components

Mt. Sterling, occasionally flooded, and similar soils
Extent: 5 to 25 percent of the unit

Humeston, occasionally flooded, 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

76B—Ladoga silt loam, 2 to 5 percent slopes

Component Description

Ladoga and similar soils
Extent: 90 to 100 percent of the unit
Position on the landform: Ridges
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
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: 12.1 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Minor Dissimilar Components

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

76C—Ladoga silt loam, 5 to 9 percent slopes

Component Description

Ladoga and similar soils
Extent: 65 to 85 percent of the unit
Position on the landform: Shoulders and ridges
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: Moderately well drained
Parent material: Loess
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: 12.1 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Minor Dissimilar Components

Hedrick and similar soils
Extent: 10 to 20 percent of the unit

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

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

76D—Ladoga silt loam, 9 to 14 percent slopes

Component Description

Ladoga and similar soils
Extent: 75 to 95 percent of the unit
Position on the landform: 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: Moderately well drained
Parent material: Loess
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: 12.1 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Minor Dissimilar Components

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

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

76D2—Ladoga silt loam, 9 to 14 percent slopes, moderately eroded

Component Description

Ladoga, moderately eroded, and similar soils
Extent: 35 to 85 percent of the unit
Position on the landform: 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: Moderately well drained
Parent material: Loess
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: 2.0 percent

Minor Dissimilar Components

Bucknell, moderately eroded, and similar soils
Extent: 10 to 20 percent of the unit

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

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

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

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

86—Mt. Sterling-Zook, overwash, complex, 0 to 2 percent slopes, occasionally flooded

Component Description

Mt. Sterling, occasionally flooded, and similar soils
Extent: 45 to 75 percent of the unit
Position on the landform: 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: 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: 1.6 percent

Zook, occasionally flooded, overwash, and similar soils
Extent: 20 to 30 percent of the unit
Position on the landform: 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: 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: 13.0 inches
Content of organic matter in the upper 10 inches: 3.0 percent

Minor Dissimilar Components

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

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

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

Component Description

Nevin, rarely flooded, and similar soils
Extent: 80 to 100 percent of the unit
Position on the landform: 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
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

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

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

93D2—Shelby-Adair complex, 9 to 14 percent slopes, moderately eroded

Component Description

Shelby, moderately eroded, and similar soils
Extent: 20 to 50 percent of the unit
Position on the landform: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Clay 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: 10.0 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Adair, moderately eroded, and similar soils
Extent: 10 to 40 percent of the unit
Position on the landform: Shoulders and side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Somewhat poorly drained
Parent material: Red paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April, October)
Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 9.1 inches
Content of organic matter in the upper 10 inches: 2.2 percent

Minor Dissimilar Components

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

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

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

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

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

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

93E2—Shelby-Adair complex, 14 to 18 percent slopes, moderately eroded

Component Description

Shelby, moderately eroded, and similar soils
Extent: 15 to 75 percent of the unit
Position on the landform: Side slopes
Slope range: 14 to 18 percent
Texture of the surface layer: Clay 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: 10.0 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Adair, moderately eroded, and similar soils
Extent: 20 to 40 percent of the unit
Position on the landform: Side slopes
Slope range: 14 to 18 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Somewhat poorly drained
Parent material: Red paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April, October)
Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 9.1 inches
Content of organic matter in the upper 10 inches: 2.2 percent

Minor Dissimilar Components

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

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

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

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

172—Wabash silty clay, frequently ponded, 0 to 2 percent slopes, occasionally flooded

Component Description

Wabash, frequently ponded, occasionally flooded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landform: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: 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)
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: 6.8 inches
Content of organic matter in the upper 10 inches: 4.2 percent

Minor Dissimilar Components

Wabash silty clay loam, frequently ponded, occasionally flooded, and similar soils
Extent: 5 to 15 percent of the unit

179E—Gara loam, 14 to 18 percent slopes

Component Description

Gara and similar soils
Extent: 35 to 85 percent of the unit
Position on the landform: 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: 10.6 inches
Content of organic matter in the upper 10 inches: 2.6 percent

Minor Dissimilar Components

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

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

Udorthents, loamy, and similar soils
Extent: 5 to 15 percent of the unit

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

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

179F—Gara loam, 18 to 25 percent slopes

Component Description

Gara and similar soils
Extent: 40 to 95 percent of the unit
Position on the landform: 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: 10.6 inches
Content of organic matter in the upper 10 inches: 2.6 percent

Minor Dissimilar Components

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

Udorthents, loamy, and similar soils
Extent: 5 to 15 percent of the unit

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

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

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

179G—Gara loam, 25 to 40 percent slopes

Component Description

Gara and similar soils
Extent: 50 to 90 percent of the unit
Position on the landform: Side slopes
Slope range: 25 to 40 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: 10.6 inches
Content of organic matter in the upper 10 inches: 2.6 percent

Minor Dissimilar Components

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

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

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

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

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

Component Description

Adair, moderately eroded, and similar soils
Extent: 20 to 90 percent of the unit
Position on the landform: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Somewhat poorly drained
Parent material: Red paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April, October)
Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 9.1 inches
Content of organic matter in the upper 10 inches: 2.2 percent

Minor Dissimilar Components

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

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

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

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

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

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

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

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

Component Description

Nodaway, occasionally flooded, and similar soils
Extent: 70 to 90 percent of the unit
Position on the landform: 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: 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: 12.7 inches
Content of organic matter in the upper 10 inches: 1.5 percent

Minor Dissimilar Components

Kennebec, occasionally flooded, and similar soils
Extent: 10 to 20 percent of the unit

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

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

Component Description

Clarinda, moderately eroded, and similar soils
Extent: 65 to 85 percent of the unit
Position on the landform: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Poorly drained
Parent material: Gray paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (March, April)
Deepest depth to wet zone: More than 6.7 feet (January, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 6.7 inches
Content of organic matter in the upper 10 inches: 1.7 percent

Minor Dissimilar Components

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

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

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

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

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

222D—Clarinda silty clay loam, 9 to 14 percent slopes

Component Description

Clarinda and similar soils
Extent: 60 to 90 percent of the unit
Position on the landform: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Poorly drained
Parent material: Gray paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (March, April)
Deepest depth to wet zone: More than 6.7 feet (January, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 7.1 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Lamoni and similar soils
Extent: 10 to 20 percent of the unit

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

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

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

Component Description

Clarinda, moderately eroded, and similar soils
Extent: 45 to 95 percent of the unit
Position on the landform: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silty clay loam

Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Poorly drained
Parent material: Gray paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (March, April)
Deepest depth to wet zone: More than 6.7 feet (January, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 6.7 inches
Content of organic matter in the upper 10 inches: 1.7 percent

Minor Dissimilar Components

Clarinda, 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

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

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

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

222D3—Clarinda silty clay, 9 to 14 percent slopes, severely eroded

Component Description

Clarinda, severely eroded, and similar soils
Extent: 50 to 90 percent of the unit
Position on the landform: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silty clay
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Poorly drained
Parent material: Gray paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (March, April)
Deepest depth to wet zone: More than 6.7 feet (January, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 6.1 inches
Content of organic matter in the upper 10 inches: 1.0 percent

Minor Dissimilar Components

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

Shelby, 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

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

248—Wabash silty clay loam, occasionally ponded, 0 to 2 percent slopes, occasionally flooded

Component Description

Wabash, occasionally ponded, occasionally flooded, and similar soils
Extent: 80 to 90 percent of the unit
Position on the landform: Flood plains
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: Very poorly drained
Parent material: 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)
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: 8.4 inches
Content of organic matter in the upper 10 inches: 5.0 percent

Minor Dissimilar Components

Wabash silty clay, occasionally ponded, occasionally flooded, and similar soils
Extent: 10 to 20 percent of the unit

269—Humeston silt loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Humeston, occasionally flooded, and similar soils
Extent: 100 percent of the unit
Position on the landform: 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: 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: 11.5 inches
Content of organic matter in the upper 10 inches: 3.5 percent

273B—Olmitz loam, 2 to 5 percent slopes

Component Description

Olmitz and similar soils
Extent: 65 to 95 percent of the unit
Position on the landform: Footslopes and alluvial fans
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 local alluvium derived from 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: 9.6 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Minor Dissimilar Components

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

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

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

273C—Olmitz loam, 5 to 9 percent slopes

Component Description

Olmitz and similar soils
Extent: 60 to 90 percent of the unit
Position on the landform: Footslopes and alluvial fans
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 local alluvium derived from 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: 9.6 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Minor Dissimilar Components

Shelby and similar soils
Extent: 10 to 20 percent of the unit

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

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

324C2—Dickman fine sandy loam, loamy substratum, 5 to 9 percent slopes, moderately eroded

Component Description

Dickman, moderately eroded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landform: Shoulders and ridges
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: 7.5 inches
Content of organic matter in the upper 10 inches: 1.1 percent

Minor Dissimilar Components

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

324D2—Dickman fine sandy loam, loamy substratum, 9 to 14 percent slopes, moderately eroded

Component Description

Dickman, moderately eroded, and similar soils
Extent: 85 to 95 percent of the unit
Position on the landform: Side slopes
Slope range: 9 to 14 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: 7.5 inches
Content of organic matter in the upper 10 inches: 1.1 percent

Minor Dissimilar Components

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

354—Aquolls, ponded, 0 to 1 percent slopes

Component Description

Aquolls, ponded, and similar soils
Extent: 100 percent of the unit

Slope range: 0 to 1 percent
Depth to restrictive feature: Very deep (more than 60 inches)
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: 1.0 foot (February, March, April, May, June, July, August, September, October, November)

368—Macksburg silty clay loam, 0 to 2 percent slopes

Component Description

Macksburg and similar soils
Extent: 75 to 95 percent of the unit
Position on the landform: Ridges and 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: 12.1 inches
Content of organic matter in the upper 10 inches: 4.6 percent

Minor Dissimilar Components

Winterset and similar soils
Extent: 5 to 25 percent of the unit

369—Winterset silty clay loam, 0 to 2 percent slopes

Component Description

Winterset and similar soils
Extent: 100 percent of the unit
Position on the landform: 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: 11.9 inches
Content of organic matter in the upper 10 inches: 5.2 percent

370—Sharpsburg silty clay loam, 0 to 2 percent slopes

Component Description

Sharpsburg and similar soils
Extent: 90 to 100 percent of the unit
Position on the landform: Ridges and 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: Moderately well drained
Parent material: Loess
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: 11.9 inches
Content of organic matter in the upper 10 inches: 3.4 percent

Minor Dissimilar Components

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

370B—Sharpsburg silty clay loam, 2 to 5 percent slopes

Component Description

Sharpsburg and similar soils
Extent: 90 to 100 percent of the unit
Position on the landform: Ridges
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
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: 11.9 inches
Content of organic matter in the upper 10 inches: 3.4 percent

Minor Dissimilar Components

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

371C2—Sharpsburg-Nira complex, 5 to 9 percent slopes, moderately eroded

Component Description

Sharpsburg, moderately eroded, and similar soils
Extent: 25 to 50 percent of the unit
Position on the landform: Shoulders, ridges, 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
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: 11.6 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Nira, moderately eroded, and similar soils
Extent: 25 to 35 percent of the unit
Position on the landform: Shoulders, ridges, 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
Flooding: None
Shallowest depth to wet zone: 2.0 feet (April)
Deepest depth to wet zone: 5.0 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: 2.0 percent

Minor Dissimilar Components

Nira, slightly eroded, and similar soils
Extent: 5 to 20 percent of the unit

Sharpsburg, slightly eroded, and similar soils
Extent: 10 to 20 percent of the unit

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

371D2—Sharpsburg-Nira complex, 9 to 14 percent slopes, moderately eroded

Component Description

Sharpsburg, moderately eroded, and similar soils
Extent: 25 to 75 percent of the unit
Position on the landform: 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: Moderately well drained
Parent material: Loess
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: 11.6 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Nira, moderately eroded, and similar soils
Extent: 15 to 25 percent of the unit
Position on the landform: 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: Moderately well drained
Parent material: Loess
Flooding: None
Shallowest depth to wet zone: 2.0 feet (April)
Deepest depth to wet zone: 5.0 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: 2.0 percent

Minor Dissimilar Components

Sharpsburg, slightly eroded, and similar soils
Extent: 10 to 20 percent of the unit

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

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

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

421C2—Gara-Bucknell complex, 5 to 9 percent slopes, moderately eroded

Component Description

Gara, moderately eroded, and similar soils
Extent: 5 to 65 percent of the unit
Position on the landform: Shoulders, ridges, and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Clay 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: 9.8 inches
Content of organic matter in the upper 10 inches: 1.5 percent

Bucknell, moderately eroded, and similar soils
Extent: 30 to 40 percent of the unit
Position on the landform: Shoulders, ridges, and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: 7 inches to abrupt textural change

Drainage class: Somewhat poorly drained
Parent material: Gray paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April, October)
Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 8.1 inches
Content of organic matter in the upper 10 inches: 2.0 percent

Minor Dissimilar Components

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

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

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

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

Rinda, slightly eroded, and similar soils
Extent: 0 to 10 percent of the unit

421D2—Gara-Bucknell complex, 9 to 14 percent slopes, moderately eroded

Component Description

Gara, moderately eroded, and similar soils
Extent: 20 to 65 percent of the unit
Position on the landform: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Clay 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: 9.8 inches
Content of organic matter in the upper 10 inches: 1.5 percent

Bucknell, moderately eroded, and similar soils
Extent: 25 to 35 percent of the unit
Position on the landform: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Somewhat poorly drained
Parent material: Gray paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April, October)

Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 8.1 inches
Content of organic matter in the upper 10 inches: 2.0 percent

Minor Dissimilar Components

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

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

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

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

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

421E2—Gara-Bucknell complex, 14 to 18 percent slopes, moderately eroded

Component Description

Gara, moderately eroded, and similar soils
Extent: 25 to 65 percent of the unit
Position on the landform: Side slopes
Slope range: 14 to 18 percent
Texture of the surface layer: Clay 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: 9.8 inches
Content of organic matter in the upper 10 inches: 1.5 percent

Bucknell, moderately eroded, and similar soils
Extent: 20 to 30 percent of the unit
Position on the landform: Side slopes
Slope range: 14 to 18 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Somewhat poorly drained
Parent material: Gray paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April, October)
Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 8.1 inches
Content of organic matter in the upper 10 inches: 2.0 percent

Minor Dissimilar Components

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

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

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

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

435—Zook-Mt. Sterling complex, 0 to 2 percent slopes, occasionally flooded

Component Description

Zook, occasionally flooded, and similar soils
Extent: 20 to 60 percent of the unit
Position on the landform: Flood plains
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: 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: 10.7 inches
Content of organic matter in the upper 10 inches: 6.0 percent

Mt. Sterling, occasionally flooded, and similar soils
Extent: 30 to 40 percent of the unit
Position on the landform: 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: 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: 1.6 percent

Minor Dissimilar Components

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

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

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

469C2—Lamoni-Clarinda-Shelby complex, 5 to 9 percent slopes, moderately eroded

Component Description

Lamoni, moderately eroded, and similar soils
Extent: 10 to 60 percent of the unit
Position on the landform: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Somewhat poorly drained
Parent material: Gray paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April, October)
Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 8.9 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Clarinda, moderately eroded, and similar soils
Extent: 25 to 35 percent of the unit
Position on the landform: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Poorly drained
Parent material: Gray paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (March, April)
Deepest depth to wet zone: More than 6.7 feet (January, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 6.7 inches
Content of organic matter in the upper 10 inches: 1.7 percent

Shelby, moderately eroded, and similar soils
Extent: 15 to 25 percent of the unit
Position on the landform: Side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Clay 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: 10.0 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

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

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

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

469C3—Lamoni-Clarinda-Shelby complex, 5 to 9 percent slopes, severely eroded

Component Description

Lamoni, severely eroded, and similar soils
Extent: 10 to 60 percent of the unit
Position on the landform: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Somewhat poorly drained
Parent material: Gray paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April, October)
Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 9.2 inches
Content of organic matter in the upper 10 inches: 1.7 percent

Clarinda, severely eroded, and similar soils
Extent: 25 to 35 percent of the unit
Position on the landform: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Silty clay
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Poorly drained
Parent material: Gray paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (March, April)
Deepest depth to wet zone: More than 6.7 feet (January, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 6.1 inches
Content of organic matter in the upper 10 inches: 1.0 percent

Shelby, severely eroded, and similar soils
Extent: 15 to 25 percent of the unit
Position on the landform: Side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Clay 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: 9.7 inches
Content of organic matter in the upper 10 inches: 0.7 percent

Minor Dissimilar Components

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

Lamoni, slightly eroded, and similar soils
Extent: 0 to 10 percent of the unit

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

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

Component Description

Lamoni, moderately eroded, and similar soils
Extent: 10 to 70 percent of the unit
Position on the landform: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Somewhat poorly drained
Parent material: Gray paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April, October)
Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 8.9 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Shelby, moderately eroded, and similar soils
Extent: 25 to 45 percent of the unit
Position on the landform: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Clay 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: 10.0 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

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

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

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

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

545B—Zook-Ely-Gullied land complex, 2 to 5 percent slopes

Component Description

Zook and similar soils
Extent: 30 to 60 percent of the unit
Position on the landform: 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: 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)
Ponding: None
Available water capacity to a depth of 60 inches: 10.7 inches
Content of organic matter in the upper 10 inches: 6.0 percent

Ely and similar soils
Extent: 25 to 35 percent of the unit
Position on the landform: Footslopes and alluvial fans 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: 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: 12.1 inches
Content of organic matter in the upper 10 inches: 5.3 percent

Gullied land
Extent: 10 to 25 percent of the unit
Position on the landform: Upland drainageways

Minor Dissimilar Components

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

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

Zook, overwash, and similar soils
Extent: 0 to 10 percent of the unit

569C—Nira-Clearfield complex, 5 to 9 percent slopes

Component Description

Nira and similar soils
Extent: 25 to 65 percent of the unit
Position on the landform: 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
Flooding: None
Shallowest depth to wet zone: 2.0 feet (April)
Deepest depth to wet zone: 5.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Clearfield and similar soils
Extent: 30 to 40 percent of the unit
Position on the landform: 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: Poorly drained
Parent material: Loess and the underlying gray paleosol
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: 11.1 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Minor Dissimilar Components

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

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

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

579E3—Bucknell-Hedrick complex, 14 to 18 percent slopes, severely eroded

Component Description

Bucknell, severely eroded, and similar soils
Extent: 25 to 85 percent of the unit
Position on the landform: Side slopes
Slope range: 14 to 18 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Somewhat poorly drained

Parent material: Gray paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April, October)
Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 8.9 inches
Content of organic matter in the upper 10 inches: 0.7 percent

Hedrick, severely eroded, and similar soils
Extent: 15 to 55 percent of the unit
Position on the landform: 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: Moderately well drained
Parent material: Loess
Flooding: None
Shallowest depth to wet zone: 2.0 feet (April)
Deepest depth to wet zone: 5.0 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: 0.7 percent

Minor Dissimilar Components

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

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

794C2—Armstrong-Ladoga complex, 5 to 9 percent slopes, moderately eroded

Component Description

Armstrong, moderately eroded, and similar soils
Extent: 55 to 75 percent of the unit
Position on the landform: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Red paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April, October)
Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 8.8 inches
Content of organic matter in the upper 10 inches: 1.5 percent

Ladoga, moderately eroded, and similar soils
Extent: 25 to 35 percent of the unit

Position on the landform: 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: Moderately well drained
Parent material: Loess
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: 2.0 percent

Minor Dissimilar Components

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

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

Component Description

Lamoni, moderately eroded, and similar soils
Extent: 30 to 85 percent of the unit
Position on the landform: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: 7 inches to abrupt textural change
Drainage class: Somewhat poorly drained
Parent material: Gray paleosol and the underlying subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April, October)
Deepest depth to wet zone: More than 6.7 feet (January, February, July, August, September)
Ponding: None
Available water capacity to a depth of 60 inches: 8.9 inches
Content of organic matter in the upper 10 inches: 2.1 percent

Minor Dissimilar Components

Lamoni, severely eroded, and similar soils
Extent: 10 to 20 percent of the unit

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

Shelby, 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

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

870B—Sharpsburg silty clay loam, terrace, 1 to 5 percent slopes

Component Description

Sharpsburg, terrace, and similar soils
Extent: 80 to 90 percent of the unit
Position on the landform: Treads on stream terraces
Slope range: 1 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
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: 11.9 inches
Content of organic matter in the upper 10 inches: 3.4 percent

Minor Dissimilar Components

Macksburg, terrace, and similar soils
Extent: 10 to 20 percent of the unit

870C2—Sharpsburg silty clay loam, terrace, 5 to 9 percent slopes, moderately eroded

Component Description

Sharpsburg, terrace, moderately eroded, and similar soils
Extent: 80 to 90 percent of the unit
Position on the landform: Risers on stream terraces
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
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: 11.6 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Minor Dissimilar Components

Nira, terrace, moderately eroded, and similar soils
Extent: 10 to 20 percent of the unit

870D2—Sharpsburg silty clay loam, terrace, 9 to 14 percent slopes, moderately eroded

Component Description

Sharpsburg, terrace, moderately eroded, and similar soils
Extent: 65 to 85 percent of the unit
Position on the landform: Risers on stream terraces
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: Moderately well drained
Parent material: Loess
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: 11.6 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Minor Dissimilar Components

Nira, terrace, moderately eroded, and similar soils
Extent: 10 to 20 percent of the unit

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

876B—Ladoga silt loam, terrace, 1 to 5 percent slopes

Component Description

Ladoga, terrace, and similar soils
Extent: 100 percent of the unit
Position on the landform: Treads on stream terraces
Slope range: 1 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
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: 12.1 inches
Content of organic matter in the upper 10 inches: 2.4 percent

876C2—Ladoga silt loam, terrace, 5 to 9 percent slopes, moderately eroded

Component Description

Ladoga, terrace, moderately eroded, and similar soils
Extent: 60 to 80 percent of the unit
Position on the landform: 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: Moderately well drained
Parent material: Loess
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: 2.0 percent

Minor Dissimilar Components

Hedrick, terrace, moderately eroded, and similar soils
Extent: 10 to 20 percent of the unit

Hedrick, terrace, severely eroded, and similar soils
Extent: 10 to 20 percent of the unit

876D2—Ladoga silt loam, terrace, 9 to 14 percent slopes, moderately eroded

Component Description

Ladoga, terrace, moderately eroded, and similar soils
Extent: 65 to 85 percent of the unit
Position on the landform: Risers on stream terraces
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: Moderately well drained
Parent material: Loess
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: 2.0 percent

Minor Dissimilar Components

Hedrick, terrace, moderately eroded, and similar soils
Extent: 10 to 20 percent of the unit

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

2368B—Macksburg-Nira complex, 2 to 5 percent slopes

Component Description

Macksburg and similar soils
Extent: 55 to 85 percent of the unit
Position on the landform: Ridges
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: 12.1 inches
Content of organic matter in the upper 10 inches: 4.6 percent

Nira and similar soils
Extent: 15 to 35 percent of the unit
Position on the landform: Ridges
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
Flooding: None
Shallowest depth to wet zone: 2.0 feet (April)
Deepest depth to wet zone: 5.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Minor Dissimilar Components

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

5030—Pits, limestone quarries

- This map unit consists of areas from which limestone has been removed.

5040—Udorthents, loamy

Component Description

Udorthents, loamy, and similar soils
Extent: 100 percent of the unit
Texture of the surface layer: Variable
Depth to restrictive feature: Very deep (more than 60 inches)
Flooding: None
Ponding: None

5041—Udorthents, reclaimed

Component Description

Udorthents, reclaimed, and similar soils
Extent: 100 percent of the unit
Texture of the surface layer: Variable
Depth to restrictive feature: Very deep (more than 60 inches)
Flooding: None
Ponding: None

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, smectitic, 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.

Adair Series

Typical Pedon

Adair clay loam, in an area of Shelby-Adair complex, 9 to 14 percent slopes, moderately eroded, in a pasture; Adams County, Iowa; about 385 feet east and 580 feet south of the northwest corner of sec. 31, T. 72 N., R. 32 W.; USGS Lenox, Iowa, topographic quadrangle; lat. 40 degrees 59 minutes 50 seconds N. and long. 94 degrees 35 minutes 05.3 seconds W., NAD 83:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) clay loam, grayish brown (10YR 5/2), dry; weak fine subangular blocky structure; friable; common very fine roots; common very fine tubular pores; neutral; abrupt smooth boundary.

2Bt1—7 to 17 inches; brown (7.5YR 4/4) clay; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; common fine roots; common very fine tubular pores; many distinct brown (7.5YR 4/3) clay films on faces of peds; few fine distinct yellowish red (5YR 4/6) redoximorphic concentrations; about 1 percent subrounded fine gravel; slightly acid; clear smooth boundary.

2Bt2—17 to 24 inches; yellowish brown (10YR 5/4) clay loam; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine roots; many very fine tubular pores; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine distinct yellowish brown (10YR 5/6) redoximorphic concentrations; common fine distinct grayish brown (10YR 5/2) redoximorphic depletions; about 3 percent subrounded fine gravel; slightly acid; gradual smooth boundary.

2Bt3—24 to 34 inches; yellowish brown (10YR 5/4) clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common very fine roots; common very fine tubular pores; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; common medium distinct yellowish brown (10YR 5/6) redoximorphic concentrations; common medium distinct grayish brown (10YR 5/2) redoximorphic depletions; about 2 percent subrounded fine gravel; slightly acid; gradual smooth boundary.

2Bt4—34 to 45 inches; about 60 percent yellowish brown (10YR 5/4) and 40 percent yellowish brown (10YR 5/6) clay loam; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; common very fine roots; common very fine tubular pores; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; common medium distinct grayish brown (10YR 5/2) redoximorphic depletions; about 2 percent subrounded fine gravel; slightly acid; gradual smooth boundary.

2Bt5—45 to 59 inches; about 60 percent yellowish brown (10YR 5/4) and 40 percent yellowish brown (10YR 5/6) clay loam; weak coarse prismatic structure parting to weak medium subangular blocky; firm; common very fine tubular pores; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine prominent black (10YR 2/1) manganese coatings on faces of peds; common medium distinct grayish brown (10YR 5/2) redoximorphic depletions; about 2 percent subrounded fine gravel; slightly acid; abrupt wavy boundary.

2Bk—59 to 74 inches; yellowish brown (10YR 5/6) clay loam; weak coarse prismatic structure; firm; common very fine tubular pores; common fine prominent very pale brown (10YR 8/2) carbonate masses; few fine prominent very pale brown (10YR 8/2) carbonate nodules; common medium prominent black (10YR 2/1) manganese coatings on faces of peds; many medium prominent grayish brown (10YR 5/2) redoximorphic depletions; about 2 percent subrounded fine gravel; strongly effervescent; slightly alkaline; clear smooth boundary.

2C—74 to 80 inches; about 50 percent yellowish brown (10YR 5/6) and 50 percent grayish brown (2.5Y 5/2) clay loam; massive; firm; common very fine tubular pores; common fine prominent black (10YR 2/1) manganese coatings; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; about 2 percent subrounded fine gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 40 to 60 inches.

Special features: Some pedons have a stone line or thin layer, 1 to 5 inches thick, of gravelly and sandy materials at the base of the loess or loess and loamy outwash or erosional sediments.

Ap or A horizon:
Hue—10YR or 7.5YR
Value—2 or 3
Chroma—1 or 2
Texture—clay loam or silty clay loam
Reaction—strongly acid to neutral

2Bt horizon:
Hue—2.5YR to 10YR
Value—3 to 5
Chroma—3 to 6
Texture—clay loam or clay
Reaction—strongly acid to slightly acid

2Bk horizon:
Hue—2.5YR to 10YR
Value—3 to 5
Chroma—3 to 6
Texture—clay loam
Reaction—slightly alkaline or moderately alkaline

2C horizon:
Hue—10YR
Value—4 or 5
Chroma—2 to 6
Texture—clay loam
Reaction—slightly acid to slightly alkaline

Taxadjunct features: The moderately eroded and severely eroded Adair soils in this survey area do not have a mollic epipedon. The moderately eroded Adair soils are classified as fine, smectitic, mesic Aquertic Hapludalfs. The severely eroded Adair soils are classified as fine, smectitic, mesic Aquertic Chromic Hapludalfs.

Armstrong Series

Typical Pedon

Armstrong clay loam, in an area of Armstrong-Ladoga complex, 5 to 9 percent slopes, moderately eroded, in a cultivated field in the uplands; Adams County, Iowa; about 50 feet east and 568 feet north of the southwest corner of sec. 24, T. 72 N., R. 35 W.; USGS Carbon, Iowa, topographic quadrangle; lat. 41 degrees 01 minute 04 seconds N. and long. 94 degrees 50 minutes 02 seconds W., NAD 83:

Ap—0 to 5 inches; very dark grayish brown (10YR 3/2) clay loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; common very fine roots; common very fine tubular pores; slightly acid; abrupt smooth boundary.

Bt1—5 to 11 inches; about 80 percent brown (7.5Y 4/4) and 20 percent dark yellowish brown (10YR 4/4) clay loam; moderate fine subangular blocky structure; firm; common very fine roots; common fine tubular pores; few distinct brown (7.5YR 4/2) clay films on vertical faces of peds; few distinct very dark grayish brown (10YR 3/2) organic stains on vertical faces of peds; many distinct light gray (10YR 7/1) silt coatings on vertical faces of peds; common fine prominent yellowish red (5YR 4/6) redoximorphic concentrations; stone line at a depth of 11 inches; slightly acid; clear smooth boundary.

2Bt2—11 to 18 inches; brown (7.5YR 4/4) clay; moderate fine prismatic structure parting to moderate fine subangular blocky; very firm; common very fine roots; common very fine tubular pores; common distinct brown (7.5YR 4/3) clay films on vertical faces of peds; many medium distinct yellowish red (5YR 4/6) redoximorphic concentrations; moderately acid; clear smooth boundary.

2Bt3—18 to 26 inches; brown (7.5YR 5/4) clay loam; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine roots; common very fine tubular pores; common distinct brown (7.5YR 4/4) clay films on vertical faces of peds; common fine distinct grayish brown (10YR 5/2) redoximorphic depletions; strongly acid; clear smooth boundary.

2Bt4—26 to 36 inches; about 60 percent light olive brown (2.5Y 5/3) and 40 percent yellowish brown (10YR 5/4) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine tubular pores; few distinct olive brown (2.5Y 4/3) clay films on vertical faces of peds; few fine faint grayish brown (2.5Y 5/2) redoximorphic depletions; moderately acid; clear smooth boundary.

2Bt5—36 to 50 inches; about 70 percent light olive brown (2.5Y 5/3) and 30 percent yellowish brown (10YR 5/4) clay loam; weak medium prismatic structure parting to weak medium subangular blocky; firm; common very fine tubular pores; few distinct olive brown (2.5Y 4/3) clay films on vertical faces of peds; common medium prominent strong brown (7.5YR 4/6) redoximorphic concentrations; common fine faint grayish brown (2.5Y 5/2) redoximorphic depletions; slightly acid; gradual smooth boundary.

2BC—50 to 62 inches; about 70 percent light yellowish brown (2.5Y 6/3) and 30 percent yellowish brown (10YR 5/4) clay loam; weak coarse prismatic structure; firm; common very fine tubular pores; common medium prominent black (7.5YR 2.5/1) iron-manganese masses; common coarse prominent strong brown (7.5YR 5/6) redoximorphic concentrations; common medium faint grayish brown (2.5Y 5/2) redoximorphic depletions; neutral; gradual smooth boundary.

2C—62 to 80 inches; about 60 percent yellowish brown (10YR 5/4) and 40 percent light brownish gray (2.5Y 6/2) clay loam; massive; firm; common very fine tubular pores; common fine prominent black (7.5YR 2.5/1) iron-manganese masses; neutral.

Range in Characteristics

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

E horizon (where present):
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam or loam
Reaction—moderately acid to neutral

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—2 to 6
Texture—loam or clay loam
Reaction—moderately acid to neutral

2Bt horizon:
Hue—5YR or 7.5YR in the upper part; 10YR or 2.5Y in the lower part
Value—4 or 5
Chroma—2 to 6
Texture—clay loam or clay
Reaction—very strongly acid to slightly acid

2BC and 2C horizons:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—clay loam
Reaction—moderately acid to slightly alkaline

Bremer Series

Typical Pedon

Bremer silty clay loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field on a stream terrace; Adams County, Iowa; about 1,450 feet east and 125 feet north of the southwest corner of sec. 20, T. 71 N., R. 35 W.; USGS Villisca, Iowa, topographic quadrangle; lat. 40 degrees 55 minutes 48.6 seconds N. and long. 94 degrees 54 minutes 13.2 seconds W., NAD 83:

Ap—0 to 6 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure parting to moderate very fine subangular blocky; friable; common fine roots; common very fine tubular pores; moderately acid; abrupt smooth boundary.

A1—6 to 12 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; friable; common very fine roots; common very fine tubular pores; slightly acid; clear smooth boundary.

A2—12 to 19 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine prismatic structure parting to moderate fine subangular blocky; friable; common very fine roots; common very fine tubular pores; very many distinct black (10YR 2/1) organic stains on vertical faces of peds; few fine prominent strong brown (7.5YR 4/6) redoximorphic concentrations on faces of peds; slightly acid; clear smooth boundary.

Btg1—19 to 25 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common very fine roots; common very fine tubular pores; many distinct very dark grayish brown (2.5Y 3/2) clay films on all faces of peds; common distinct very dark brown (10YR 2/2) organic stains on vertical faces of peds; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations on faces of peds; slightly acid; clear smooth boundary.

Btg2—25 to 33 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine tubular pores; few distinct dark grayish brown (2.5Y 4/2) clay films on vertical faces of peds; few distinct black (10YR 2/1) organic stains on all faces of peds; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations on faces of peds; slightly acid; clear smooth boundary.

Btg3—33 to 42 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine tubular pores; few distinct dark grayish brown (2.5Y 4/2) clay films on vertical faces of peds; few distinct black (10YR 2/1) organic stains on vertical faces of peds; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations on faces of peds; slightly acid; gradual smooth boundary.

Btg4—42 to 51 inches; grayish brown (2.5Y 5/2) silty clay loam; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; friable; common very fine tubular pores; few distinct dark grayish brown (2.5Y 4/2) clay films on vertical faces of peds; few distinct black (10YR 2/1) organic stains on vertical faces of peds; common fine and medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations on faces of peds; neutral; gradual smooth boundary.

Btg5—51 to 59 inches; grayish brown (2.5Y 5/2) silty clay loam; weak coarse prismatic structure parting to weak coarse subangular blocky; friable; common very fine tubular pores; few distinct dark grayish brown (2.5Y 4/2) clay films on vertical faces of peds; about 5 percent black (10YR 2/1) krotovinas; common fine and medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations on faces of peds; neutral; gradual smooth boundary.

BCg—59 to 66 inches; grayish brown (2.5Y 5/2) silty clay loam; weak coarse prismatic structure; friable; common very fine tubular pores; about 6 percent black (10YR 2/1) krotovinas; common fine and medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations on faces of peds; neutral; gradual smooth boundary.

Cg—66 to 80 inches; grayish brown (2.5Y 5/2) silty clay loam; massive; friable; common very fine tubular pores; common medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations on faces of peds; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 18 to 36 inches
Depth to carbonates: More than 60 inches

Ap or A horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam
Reaction—moderately acid to neutral

Btg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 5
Chroma—1 or 2
Texture—silty clay loam or silty clay
Reaction—moderately acid to neutral

BCg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam
Reaction—moderately acid to neutral

Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam
Reaction—moderately acid to neutral

Bucknell Series

Typical Pedon

Bucknell silty clay loam, in an area of Gara-Bucknell complex, 9 to 14 percent slopes, moderately eroded, in a cultivated field in the uplands; Adams County, Iowa; about 1,100 feet west and 1,390 feet north of the southeast corner of sec. 13, T. 71 N., R. 35 W.; USGS Brooks, Iowa, topographic quadrangle; lat. 40 degrees 56 minutes 52 seconds N. and long. 94 degrees 49 minutes 04.3 seconds W., NAD 83:

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; about 5 percent streaks and pockets of dark grayish brown (2.5Y 4/2) subsoil material; weak fine granular structure; friable; many fine roots; common very fine pores; very strongly acid; clear smooth boundary.

2BE—7 to 11 inches; dark grayish brown (2.5Y 4/2) clay; weak fine subangular blocky structure; firm; common fine roots; common very fine pores; common fine distinct gray (10YR 6/1) silt coatings on vertical faces of peds; common distinct very dark grayish brown (10YR 3/2) organic stains on vertical faces of peds; common fine distinct dark yellowish brown (10YR 4/4) redoximorphic concentrations; strongly acid; clear smooth boundary.

2Bt1—11 to 27 inches; grayish brown (2.5Y 5/2) clay; moderate medium subangular blocky structure; firm; common very fine roots; common very fine pores; very many distinct dark grayish brown (10YR 4/2) clay films on vertical faces of peds; common fine distinct light olive brown (2.5Y 5/4) redoximorphic concentrations; about 2 percent subrounded gravel; strongly acid; clear smooth boundary.

2Bt2—27 to 34 inches; grayish brown (2.5Y 5/2) clay; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine roots; common very fine pores; common distinct dark grayish brown (10YR 4/2) clay films on vertical faces of peds; many medium prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; about 1 percent subrounded gravel; moderately acid; gradual smooth boundary.

2Bt3—34 to 47 inches; mottled grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine roots; common very fine pores;

common distinct gray (2.5Y 5/1) clay films on vertical faces of peds; many medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations; about 2 percent subrounded gravel; moderately acid; gradual smooth boundary.

2Bt4—47 to 59 inches; mottled yellowish brown (10YR 5/6) and gray (5Y 6/1) clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine pores; few distinct gray (2.5Y 5/1) clay films on vertical faces of peds; common medium faint strong brown (7.5YR 5/6) redoximorphic concentrations; about 2 percent subrounded gravel; moderately acid; gradual smooth boundary.

2BC—59 to 71 inches; mottled yellowish brown (10YR 5/6) and gray (5Y 6/1) clay loam; weak medium prismatic structure parting to weak medium subangular blocky; firm; common very fine pores; common fine faint strong brown (7.5YR 5/6) redoximorphic concentrations; about 2 percent subrounded gravel; moderately acid; abrupt wavy boundary.

2C—71 to 80 inches; mottled yellowish brown (10YR 5/6) and gray (2.5Y 6/1) clay loam; massive; firm; common very fine pores; few fine faint strong brown (7.5YR 5/6) redoximorphic concentrations; about 3 percent subrounded gravel; slightly effervescent; slightly alkaline.

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—silty clay loam or clay loam
Reaction—very strongly acid to neutral

2BE horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2
Texture—clay
Reaction—very strongly acid to moderately acid

2Bt horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—1 or 2 in the upper part; 1 to 8 in the lower part
Texture—clay in the upper part; clay loam in the lower part
Reaction—strongly acid to moderately acid

2BC and 2C horizons:
Hue—10YR to 5Y
Value—4 to 6
Chroma—1 to 8
Texture—clay loam
Reaction—moderately acid to slightly alkaline

Clarinda Series

Typical Pedon

Clarinda silty clay loam, in an area of Lamoni-Clarinda-Shelby complex, 5 to 9 percent slopes, moderately eroded, in a cultivated field in the uplands; Adams

County, Iowa; about 2,410 feet south and 1,650 feet west of the northeast corner of sec. 34, T. 71 N., R. 33 W.; USGS Corning South, Iowa, topographic quadrangle; lat. 40 degrees 54 minutes 28.8 seconds N. and long. 94 degrees 37 minutes 44.4 seconds W., NAD 83:

Ap—0 to 6 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak very fine granular structure; friable; many very fine roots; many very fine tubular pores; moderately acid; abrupt smooth boundary.

2Btg1—6 to 17 inches; dark grayish brown (2.5Y 4/2) silty clay; moderate very fine subangular blocky structure; firm; many very fine roots; many very fine tubular pores; few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few distinct very dark gray (10YR 3/1) organic stains on faces of peds; few fine prominent strong brown (7.5YR 4/6) redoximorphic concentrations; moderately acid; clear smooth boundary.

2Btg2—17 to 25 inches; grayish brown (2.5Y 5/2) silty clay; moderate fine prismatic structure parting to moderate fine and medium subangular blocky; very firm; common very fine roots; many very fine tubular pores; few distinct grayish brown (10YR 5/2) clay films on faces of peds; common distinct very dark gray (10YR 3/1) organic stains on all faces of peds; few fine prominent strong brown (7.5YR 4/6) and common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly acid; gradual smooth boundary.

2Btg3—25 to 39 inches; grayish brown (2.5Y 5/2) silty clay; moderate fine prismatic structure parting to moderate medium subangular blocky; very firm; many very fine tubular pores; few distinct clay films on all faces of peds; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly acid; gradual smooth boundary.

2Btg4—39 to 63 inches; grayish brown (2.5Y 5/2) silty clay; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; many very fine tubular pores; few distinct grayish brown (10YR 5/2) clay films on faces of peds; few medium prominent strong brown (7.5YR 4/6) and common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; common fine faint light brownish gray (2.5Y 6/2) redoximorphic depletions on faces of peds; neutral; gradual smooth boundary.

2Btg5—63 to 80 inches; grayish brown (2.5Y 5/2) silty clay; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; very firm; common very fine tubular pores; few distinct grayish brown (10YR 5/2) clay films on all faces of peds; few fine prominent strong brown (7.5YR 4/6) and common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; common fine faint light brownish gray (2.5Y 6/2) redoximorphic depletions; neutral.

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—silty clay loam or silty clay
Reaction—strongly acid to neutral

2Btg horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—1 or 2

Texture—silty clay or clay
Reaction—strongly acid to moderately alkaline

2C horizon (where present):
Hue—10YR to 5Y
Value—4 to 6
Chroma—1 to 6
Texture—clay loam
Reaction—moderately acid to slightly alkaline

Taxadjunct features: The moderately eroded and severely eroded Clarinda soils in this survey area do not have a mollic epipedon. These soils are classified as fine, smectitic, mesic Vertic Epiaqualfs.

Clearfield Series

Typical Pedon

Clearfield silty clay loam, in an area of Nira-Clearfield complex, 5 to 9 percent slopes, in a cultivated field in the uplands; Adams County, Iowa; about 2,220 feet east and 2,500 feet south of the northwest corner of sec. 22, T. 71 N., R. 33 W.; USGS Corning South, Iowa, topographic quadrangle; lat. 40 degrees 56 minutes 90.8 seconds N. and long. 94 degrees 38 minutes 03.8 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 granular structure; friable; many very fine roots; common very fine tubular pores; slightly acid; abrupt smooth boundary.

A—7 to 12 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate very fine subangular blocky structure; friable; common very fine roots; many very fine tubular pores; slightly acid; clear smooth boundary.

Btg1—12 to 19 inches; dark gray (10YR 4/1) silty clay loam; moderate fine prismatic structure parting to moderate very fine subangular blocky; firm; common very fine roots; many very fine tubular pores; common distinct very dark gray (10YR 3/1) organic stains on faces of peds; common fine prominent light olive brown (2.5Y 5/4) redoximorphic concentrations; slightly acid; clear smooth boundary.

Btg2—19 to 25 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate very fine subangular blocky; firm; common very fine roots; many very fine tubular pores; few distinct very dark gray (10YR 3/1) clay films on vertical faces of peds; common fine distinct light olive brown (2.5Y 5/4) redoximorphic concentrations; slightly acid; gradual smooth boundary.

Btg3—25 to 32 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common very fine roots; many very fine tubular pores; very few distinct dark grayish brown (2.5Y 4/2) clay films on vertical faces of peds; common fine prominent strong brown (7.5YR 4/6) and common fine distinct light olive brown (2.5Y 5/4) redoximorphic concentrations; neutral; gradual smooth boundary.

Btg4—32 to 40 inches; olive gray (5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; many very fine tubular pores; very few distinct gray (5Y 5/1) clay films on vertical faces of peds; common fine prominent strong brown (7.5YR 5/6) and common fine distinct light olive brown (2.5Y 5/4) redoximorphic concentrations; neutral; abrupt wavy boundary.

2Btg5—40 to 51 inches; gray (2.5Y 5/1) silty clay; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine tubular pores; very many distinct dark gray (2.5Y 4/1) clay films on vertical faces of peds; common fine prominent strong brown (7.5YR 5/6) and light olive brown (2.5Y 5/6) redoximorphic concentrations; slightly acid; gradual smooth boundary.

2Btg6—51 to 65 inches; gray (2.5Y 5/1) silty clay; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine tubular pores; common distinct dark gray (2.5Y 4/1) clay films on vertical faces of peds; common fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; neutral; gradual smooth boundary.

2Btg7—65 to 75 inches; gray (2.5Y 6/1) silty clay; moderate coarse prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine tubular pores; common distinct gray (2.5Y 5/1) clay films on vertical faces of peds; common medium prominent strong brown (7.5YR 4/6) and yellowish brown (10YR 5/6) redoximorphic concentrations; neutral; gradual smooth boundary.

2Btg8—75 to 80 inches; gray (2.5Y 6/1) silty clay; moderate coarse prismatic structure parting to moderate fine and medium subangular blocky; friable; common very fine tubular pores; common distinct gray (2.5Y 5/1) clay films on vertical faces of peds; many prominent strong brown (7.5YR 5/6) redoximorphic concentrations; neutral.

Range in Characteristics

Depth to carbonates: More than 60 inches

Ap or A horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam
Reaction—moderately acid to neutral

Btg horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam or silty clay
Reaction—moderately acid to neutral

2Btg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay or clay
Reaction—moderately acid to neutral

Dickman Series

Typical Pedon

Dickman fine sandy loam, loamy substratum, 9 to 14 percent slopes, moderately eroded, in a cultivated field; Adams County, Iowa; about 2,125 feet west and 2,000 feet north of the southeast corner of sec. 29, T. 72 N., R. 33 W.; USGS Corning North, Iowa, topographic quadrangle; lat. 41 degrees 00 minutes 20 seconds N. and long. 94 degrees 40 minutes 04 seconds W., NAD 83:

Ap—0 to 6 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; cloddy structure; very friable; moderately acid; abrupt smooth boundary.
Bw1—6 to 10 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak medium subangular blocky structure; very friable; strongly acid; gradual wavy boundary.
Bw2—10 to 19 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium subangular blocky structure; very friable; moderately acid; gradual wavy boundary.
Bw3—19 to 46 inches; yellowish brown (10YR 5/4) loamy fine sand; weak coarse subangular blocky structure; very friable; slightly acid; gradual wavy boundary.
Bw4—46 to 56 inches; yellowish brown (10YR 5/4) fine sandy loam; weak coarse subangular blocky structure; very friable; common fine distinct very dark brown (10YR 2/2) manganese masses; few fine distinct strong brown (7.5YR 5/6) redoximorphic concentrations; few fine distinct grayish brown (10YR 5/2) redoximorphic depletions; slightly acid; gradual wavy boundary.
BC1—56 to 69 inches; yellowish brown (10YR 5/6) fine sand; weak coarse subangular blocky structure; very friable; neutral; gradual wavy boundary.
2BC2—69 to 80 inches; yellowish brown (10YR 5/4) silt loam; weak coarse prismatic structure; firm; common faint brown (7.5YR 4/4) pressure faces on all faces of peds; many fine prominent black (10YR 2/1) manganese masses; few coarse distinct strong brown (7.5YR 4/6) redoximorphic concentrations; common coarse distinct grayish brown (2.5Y 5/2) redoximorphic depletions; neutral.

Range in Characteristics

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

Bw horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—3 or 4
Texture—sandy loam or fine sandy loam
Reaction—strongly acid to slightly acid

BC horizon:
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

2BC horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—silt loam or silty clay loam
Reaction—slightly acid or neutral

Taxadjunct features: The moderately eroded Dickman soils in this survey area do not have a mollic epipedon. These soils are classified as sandy, mixed, mesic Typic Dystrudepts.

Ely Series

Typical Pedon

Ely silty clay loam, 2 to 5 percent slopes, in a cultivated field; Keokuk County, Iowa; about 320 feet south and 1,120 feet west of the northeast corner of sec. 20, T. 77 N., R. 12 W.; USGS What Cheer, Iowa, topographic quadrangle; lat. 41 degrees 27 minutes 58 seconds N. and long. 92 degrees 15 minutes 47 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 subangular blocky structure parting to moderate fine granular; friable; few fine roots; few fine vesicular pores; abrupt smooth boundary.

A1—8 to 15 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; few fine roots; few fine vesicular pores; neutral; clear smooth boundary.

A2—15 to 24 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; few fine roots; few fine vesicular pores; neutral; clear smooth boundary.

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

Bg1—32 to 39 inches; dark grayish brown (10YR 4/2) silty clay loam; weak medium prismatic structure parting to weak fine and medium subangular blocky; friable; few fine roots; few fine vesicular pores; common dark gray (10YR 4/1) silt coatings on faces of peds; common distinct dark brown (10YR 3/3) organic coatings on faces of peds; few fine irregular masses of iron-manganese; few fine distinct yellowish brown (10YR 5/4) redoximorphic concentrations; slightly acid; gradual smooth boundary.

Bg2—39 to 47 inches; brown (10YR 4/3) silty clay loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine roots; few fine vesicular pores; common gray (10YR 5/1) silt coatings on faces of peds; few fine irregular masses of iron-manganese; common fine faint dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) and few fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; slightly acid; gradual smooth boundary.

BCg—47 to 58 inches; grayish brown (10YR 5/2) silty clay loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine roots; few fine vesicular pores; few fine irregular masses of iron-manganese; few fine faint gray (10YR 5/1) redoximorphic depletions; common fine distinct yellowish brown (10YR 5/4) and common fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; slightly acid; gradual smooth boundary.

Cg—58 to 80 inches; gray (10YR 5/1) and brown (10YR 5/3) silty clay loam; massive; friable; common fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; few fine irregular masses of iron-manganese; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 36 inches
Depth to carbonates: More than 48 inches
Special feature: Some pedons have few to many faint and distinct clay films on faces of peds, on surfaces along pores, and along root channels.

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

Bg or Btg 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

Gara Series

Typical Pedon

Gara clay loam, in an area of Gara-Bucknell complex, 9 to 14 percent slopes, moderately eroded, in a pasture in the uplands; Adams County, Iowa; about 848 feet west and 542 feet south of the northeast corner of sec. 8, T. 73 N., R. 35 W.; USGS Grant, Iowa, topographic quadrangle; lat. 41 degrees 08 minutes 36 seconds N. and long. 94 degrees 53 minutes 40 seconds W., NAD 83:

Ap—0 to 5 inches; about 95 percent very dark grayish brown (10YR 3/2) clay loam and 5 percent mixings of brown (10YR 4/3) clay loam; grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; many fine and very fine roots; slightly acid; abrupt smooth boundary.

Bt1—5 to 9 inches; brown (10YR 4/3) clay loam; moderate fine subangular blocky structure; friable; common very fine roots; very few distinct dark grayish brown (10YR 4/2) clay films on all faces of peds; common faint very dark grayish brown (10YR 3/2) organic stains on vertical faces of peds; few medium distinct yellowish brown (10YR 5/6) redoximorphic concentrations; about 1 percent gravel; slightly acid; clear wavy boundary.

Bt2—9 to 16 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; friable; common very fine roots; very few distinct brown (10YR 4/3) clay films on all faces of peds; common faint brown (10YR 5/3) redoximorphic concentrations; about 4 percent gravel; slightly acid; clear smooth boundary.

Bt3—16 to 23 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common very fine roots; common distinct brown (10YR 4/3) clay films on all faces of peds; few distinct very dark brown (10YR 2/2) iron-manganese nodules; few medium faint yellowish brown (10YR 5/4) redoximorphic concentrations; few medium distinct grayish brown (10YR 5/2) redoximorphic depletions; about 5 percent gravel; slightly acid; gradual smooth boundary.

Bt4—23 to 31 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; few distinct brown (10YR 5/3) clay films on all faces of peds; few distinct very dark grayish brown (10YR 3/2) organic stains on all faces of peds; common distinct black (10YR 2/1) iron-manganese nodules; few medium distinct dark grayish brown (10YR 4/2) redoximorphic depletions; common medium distinct dark yellowish brown (10YR 4/6) redoximorphic concentrations; about 3 percent gravel; neutral; gradual smooth boundary.

Bt5—31 to 43 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; few distinct brown (10YR 5/3) clay films on all faces of peds; common prominent strong brown (7.5YR 5/8) iron concretions; few medium distinct grayish brown (10YR 5/2) redoximorphic depletions; common medium prominent yellowish brown (10YR 5/8) redoximorphic concentrations; about 5 percent gravel; neutral; abrupt wavy boundary.

Btk1—43 to 56 inches; yellowish brown (10YR 5/4) clay loam; moderate medium and coarse angular blocky structure; firm; few distinct brown (10YR 5/3) clay films on all faces of peds; common distinct very dark brown (10YR 2/2) iron-manganese nodules; common distinct light gray (10YR 7/2) carbonate nodules; common medium distinct grayish brown (10YR 5/2) redoximorphic depletions; common medium distinct strong brown (7.5YR 5/6) redoximorphic concentrations; about 5 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

Btk2—56 to 62 inches; yellowish brown (10YR 5/4) clay loam; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few distinct brown (10YR 5/3) clay films on all faces of peds; common prominent light gray (10YR 7/2) carbonate nodules; few distinct very dark grayish brown (10YR 3/2) iron-manganese nodules; common medium distinct yellowish brown (10YR 5/6) redoximorphic concentrations; about 3 percent gravel; strongly effervescent; slightly alkaline; clear smooth boundary.

BC—62 to 73 inches; yellowish brown (10YR 5/4) clay loam; moderate coarse prismatic structure; firm; few distinct brown (10YR 5/3) clay films on all faces of peds; common distinct very pale brown (10YR 7/3) carbonate nodules; few distinct very dark gray (10YR 3/1) iron-manganese nodules; common medium prominent yellowish brown (10YR 5/8) redoximorphic concentrations; common distinct light brownish gray (10YR 6/2) redoximorphic depletions; about 7 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

C—73 to 80 inches; yellowish brown (10YR 5/4) clay loam; massive; firm; about 7 percent coarse distinct white (10YR 8/1) carbonate concretions; common prominent black (10YR 2/1) iron-manganese nodules; common medium distinct yellowish brown (10YR 5/6) redoximorphic concentrations; common medium distinct pale brown (10YR 6/2) redoximorphic depletions; about 5 percent gravel; violently effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 30 to 70 inches

Ap or A horizon:
Hue—10YR

Value—3
Chroma—1 to 3
Texture—loam, silt loam, or clay loam
Reaction—moderately acid to neutral

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—clay loam
Reaction—strongly acid to neutral

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

BC and C horizons:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 6
Texture—clay loam or loam
Reaction—slightly acid to moderately alkaline

Taxadjunct features: The severely eroded Gara soils in this survey area do not have an epipedon that meets the criteria for the Mollic subgroup. These soils are classified as fine-loamy, mixed, superactive, mesic Typic Hapludalfs.

Hedrick Series

Typical Pedon

Hedrick silt loam, 5 to 9 percent slopes, in a cultivated field; Mahaska County, Iowa; about 2 miles south and 10 miles west of New Sharon; about 570 feet north and 2,200 feet east of the southwest corner of sec. 30, T. 77 N., R. 17 W.; USGS Peoria, Iowa, topographic quadrangle; lat. 41 degrees 26 minutes 16 seconds N. and long. 92 degrees 51 minutes 48 seconds W., NAD 83:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; common fine roots; common gray (10YR 5/1) patches and gray (10YR 6/1) (dry) silt coatings on faces of peds in the lower 3 inches; neutral; clear smooth boundary.

Bt1—8 to 15 inches; brown (10YR 4/3) silty clay loam; moderate very fine angular blocky structure; friable; common fine roots; few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; common distinct very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) organic coatings on faces of peds; neutral; clear smooth boundary.

Bt2—15 to 23 inches; brown (10YR 5/3), gray (10YR 6/1), and strong brown (7.5YR 5/6) silty clay loam; moderate fine angular blocky structure; friable; few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; common distinct light gray (10YR 7/1) silt coatings on faces of peds; moderately acid; gradual smooth boundary.

Btg1—23 to 32 inches; light brownish gray (2.5Y 6/2) silty clay loam; moderate medium subangular blocky structure; firm; common distinct brown (10YR 4/3) clay films on faces of peds; common prominent black (10YR 2/1) organic stains on surfaces along root channels; common medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations; moderately acid; gradual smooth boundary.

Btg2—32 to 53 inches; light olive gray (5Y 6/2) silty clay loam; weak coarse prismatic structure parting to weak coarse angular blocky; firm; many prominent dark grayish brown (10YR 4/2) clay films on faces of peds; few prominent black (10YR 2/1) clay flows on surfaces along root channels; many coarse prominent strong brown (7.5YR 5/6) redoximorphic concentrations; slightly acid; gradual smooth boundary.

BCg—53 to 63 inches; light olive gray (5Y 6/2) silty clay loam; weak coarse prismatic structure; firm; common dark clay flows and organic flows on surfaces along root channels; common medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations; neutral; diffuse smooth boundary.

Cg—63 to 80 inches; light brownish gray (2.5Y 6/2) silt loam; massive; friable; few dark organic flows on surfaces along root channels; common coarse prominent strong brown (7.5YR 5/8) redoximorphic concentrations; moderately alkaline.

Range in Characteristics

Depth to carbonates: More than 60 inches

Note: In cultivated areas the E horizon is partially or completely mixed into the Ap horizon.

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

E horizon (where present):
Hue—10YR
Value—4 or 5
Chroma—2
Texture—silt loam or silty clay loam
Reaction—strongly acid to neutral

Bt horizon:
Hue—10YR
Value—4 to 6
Chroma—1 to 6
Texture—silty clay loam
Reaction—strongly acid to neutral

Btg horizon:
Hue—10YR to 5Y
Value—5 or 6
Chroma—1 or 2
Texture—silty clay loam
Reaction—strongly acid to slightly acid

BCg or Cg horizon:
Hue—10YR to 5Y
Value—5 or 6
Chroma—1 or 2

Texture—silty clay loam or silt loam
Reaction—slightly acid to moderately alkaline

Taxadjunct features: In this survey area, the severely eroded Hedrick soils and the severely eroded Hedrick soils on terraces do not have an epipedon that meets the criteria for the Mollic subgroup. These soils are classified as fine-silty, mixed, superactive, mesic Oxyaquic Hapludalfs.

Humeston Series

Typical Pedon

Humeston silt loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field on a flood plain; Adams County, Iowa; about 850 feet west and 1,300 feet north of the southeast corner of sec. 8, T. 71 N., R. 34 W.; USGS Brooks, Iowa, topographic quadrangle; lat. 40 degrees 57 minutes 56 seconds N. and long. 94 degrees 46 minutes 57 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 subangular blocky structure; friable; neutral; abrupt smooth boundary.

A—7 to 12 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

E1—12 to 19 inches; dark gray (10YR 4/1) silt loam, gray (10YR 6/1) dry; moderate medium platy structure; very friable; slightly acid; abrupt smooth boundary.

E2—19 to 22 inches; about 60 percent dark gray (10YR 4/1) and 40 percent very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate thick platy structure parting to weak fine subangular blocky; very friable; moderately acid; clear wavy boundary.

BE—22 to 27 inches; black (10YR 2/1) silty clay loam; weak fine prismatic structure parting to weak fine subangular blocky; friable; few distinct light gray (10YR 7/1) silt coatings on vertical faces of peds; moderately acid; clear smooth boundary.

Btg1—27 to 36 inches; black (10YR 2/1) silty clay; moderate fine prismatic structure parting to moderate fine and medium subangular blocky; firm; very many distinct black (N 2/) clay films on vertical faces of peds; few fine distinct dark grayish brown (2.5Y 4/2) redoximorphic depletions; slightly acid; gradual smooth boundary.

Btg2—36 to 45 inches; black (10YR 2/1) silty clay; moderate fine prismatic structure parting to fine and moderate medium subangular blocky; firm; very many distinct black (N 2/) clay films on vertical faces of peds; few fine distinct dark grayish brown (2.5Y 4/2) redoximorphic depletions; neutral; clear smooth boundary.

Btg3—45 to 54 inches; very dark gray (10YR 3/1) silty clay loam; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; many distinct black (10YR 2/1) clay films on vertical faces of peds; few fine faint spherical very dark brown (10YR 2/2) iron-manganese masses; few fine prominent light olive brown (2.5Y 5/4) redoximorphic concentrations; neutral; clear smooth boundary.

Btg4—54 to 64 inches; gray (5Y 5/1) silty clay loam; moderate coarse prismatic structure parting to moderate coarse subangular blocky and moderate medium subangular blocky; firm; common distinct dark gray (5Y 4/1) clay films on vertical faces of peds; few distinct very dark gray (5Y 3/1) organic stains on vertical faces of peds; few fine prominent spherical very dark brown (10YR 2/2) iron-manganese masses; few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; neutral; gradual smooth boundary.

BCg—64 to 73 inches; gray (5Y 5/1) silty clay loam; weak coarse prismatic structure; firm; few medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; neutral; clear smooth boundary.

Cg—73 to 80 inches; gray (5Y 5/1) silty clay loam; massive; firm; few medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; neutral.

Range in Characteristics

Depth to carbonates: More than 72 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
Texture—silt loam
Reaction—strongly acid to neutral

BE horizon:
Hue—10YR
Value—2 to 4
Chroma—1
Texture—silty clay loam
Reaction—strongly acid to neutral

Btg horizon:
Hue—10YR to 5Y or N
Value—2 or 3 in the upper part; 2 to 5 in the lower part
Chroma—0 or 1
Texture—silty clay loam or silty clay
Reaction—strongly acid to neutral

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

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

Judson Series

Typical Pedon

Judson silty clay loam, 2 to 5 percent slopes, in a cultivated field in the uplands; Adams County, Iowa; about 255 feet east and 250 feet south of the northwest corner of sec. 16, T. 71 N., R. 35 W.; USGS Villisca, Iowa, topographic quadrangle; lat. 40 degrees 57 minutes 29.1 seconds N. and long. 94 degrees 53 minutes 43.2 seconds W., NAD 83:

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

A1—7 to 14 inches; very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; friable; common very fine roots; common very fine tubular pores; very many distinct black (10YR 2/1) organic stains on vertical faces of peds; very strongly acid; clear smooth boundary.

A2—14 to 24 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine prismatic structure parting to weak fine subangular blocky; friable; common very fine roots; common very fine tubular pores; many distinct very dark brown (10YR 2/2) organic stains on vertical faces of peds; moderately acid; gradual smooth boundary.

A3—24 to 33 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine prismatic structure parting to weak fine subangular blocky; friable; many very fine tubular pores; many distinct very dark brown (10YR 2/2) organic stains on vertical faces of peds; moderately acid; gradual smooth boundary.

AB—33 to 42 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 5/3) dry; moderate medium prismatic structure parting to weak fine and medium subangular blocky; friable; common very fine tubular pores; many distinct very dark grayish brown (10YR 3/2) organic stains on vertical faces of peds; moderately acid; clear smooth boundary.

Bw1—42 to 53 inches; brown (10YR 4/3) silty clay loam; moderate medium prismatic structure parting to weak fine and medium subangular blocky; friable; common very fine tubular pores; common distinct dark brown (10YR 3/3) organic stains on vertical faces of peds; few prominent light gray (10YR 7/2) silt coatings on vertical faces of peds; moderately acid; gradual smooth boundary.

Bw2—53 to 61 inches; brown (10YR 4/3) silty clay loam; moderate medium prismatic structure parting to weak medium subangular blocky; friable; common very fine tubular pores; common distinct dark brown (10YR 3/3) organic stains on vertical faces of peds; many prominent light gray (10YR 7/2) silt coatings on vertical faces of peds; slightly acid; gradual smooth boundary.

Bw3—61 to 70 inches; brown (10YR 4/3) silty clay loam; moderate medium prismatic structure parting to weak medium and coarse subangular blocky; friable; common very fine tubular pores; many prominent light gray (10YR 7/2) silt coatings on vertical faces of peds; moderately acid; gradual smooth boundary.

Bw4—70 to 78 inches; brown (10YR 4/3) silty clay loam; weak coarse prismatic structure parting to weak coarse subangular blocky; friable; common very fine tubular pores; few prominent light gray (10YR 7/2) silt coatings on vertical faces of peds; slightly acid; gradual smooth boundary.

BC—78 to 80 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak coarse prismatic structure; friable; common very fine tubular pores; very few distinct light gray (10YR 7/2) silt coatings on vertical faces of peds; few medium faint yellowish brown (10YR 5/4) redoximorphic concentrations; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 32 to 60 inches
Depth to carbonates: More than 60 inches

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

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

Bw 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

Kennebec Series

Typical Pedon

Kennebec silt loam, in an area of Nodaway-Kennebec complex, 0 to 2 percent slopes, occasionally flooded, in a cultivated field on a flood plain; Adams County, Iowa; about 760 feet west and 750 feet north of the southeast corner of sec. 31, T. 71 N., R. 35 W.; USGS Villisca, Iowa, topographic quadrangle; lat. 40 degrees 54 minutes 07 seconds N. and long. 94 degrees 54 minutes 46 seconds W., NAD 83:

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

A—7 to 16 inches; very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; common very fine roots; common very fine tubular pores; moderately acid; gradual smooth boundary.

Bw1—16 to 25 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine prismatic structure parting to weak fine subangular blocky; friable; common very fine roots; many very fine tubular pores; very many distinct very dark brown (10YR 2/2) organic stains on vertical faces of peds; slightly acid; gradual smooth boundary.

Bw2—25 to 35 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak medium prismatic structure parting to weak fine subangular blocky; friable; many very fine tubular pores; many distinct very dark brown (10YR 2/2) organic stains on vertical faces of peds; slightly acid; gradual smooth boundary.

Bw3—35 to 48 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak medium prismatic structure parting to weak fine and medium subangular blocky; friable; many very fine tubular pores; many distinct very dark brown (10YR 2/2) organic stains on vertical faces of peds; neutral; gradual smooth boundary.

BC—48 to 59 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak coarse prismatic structure; friable; many very fine tubular pores; neutral; clear smooth boundary.

C—59 to 80 inches; very dark grayish brown (10YR 3/2) silt loam; massive; friable; many very fine tubular pores; few fine distinct olive brown (2.5Y 4/4) redoximorphic concentrations; neutral.

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
Value—2 to 4
Chroma—2 or 3
Texture—silt loam or silty clay loam
Reaction—slightly acid or neutral

BC or C horizon:
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

Ladoga Series

Typical Pedon

Ladoga silt loam, 2 to 5 percent slopes, in a cultivated field in the uplands; Adams County, Iowa; about 1,890 feet west and 380 feet north of the southeast corner of sec. 18, T. 72 N., R. 35 W.; USGS Morton Mills, Iowa, topographic quadrangle; lat. 41 degrees 01 minute 54 seconds N. and long. 94 degrees 55 minutes 04 seconds W., NAD 83:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; friable; common fine roots; common very fine tubular pores; strongly acid; abrupt smooth boundary.

Bt1—8 to 17 inches; brown (10YR 4/3) silty clay; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; common fine roots; common very fine tubular pores; moderately acid; gradual smooth boundary.

Bt2—17 to 24 inches; dark yellowish brown (10YR 4/4) silty clay; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; common fine roots; common very fine tubular pores; moderately acid; gradual smooth boundary.

Bt3—24 to 32 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common fine roots; common very fine tubular pores; moderately acid; gradual smooth boundary.

Bt4—32 to 40 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; common very fine tubular pores; common fine distinct grayish brown (2.5Y 5/2) redoximorphic depletions; moderately acid; gradual smooth boundary.

Bt5—40 to 47 inches; yellowish brown (10YR 5/4) silty clay loam; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; firm; common very fine tubular pores; common fine distinct yellowish brown (10YR 5/6) redoximorphic concentrations; common fine and medium distinct grayish brown (2.5Y 5/2) redoximorphic depletions; moderately acid; gradual smooth boundary.

Bt6—47 to 56 inches; brown (10YR 5/3) silty clay loam; weak coarse prismatic structure parting to weak coarse subangular blocky; friable; common very fine tubular pores; common fine prominent black (7.5YR 2.5/1) iron-manganese masses; common fine distinct yellowish brown (10YR 5/6) redoximorphic concentrations; many medium faint grayish brown (2.5Y 5/2) redoximorphic depletions; moderately acid; gradual smooth boundary.

BC—56 to 65 inches; brown (10YR 5/3) silty clay loam; weak coarse prismatic structure; friable; many very fine tubular pores; few fine prominent (7.5Y 2.5/1) iron-manganese masses; common medium distinct yellowish brown (10YR 5/6) redoximorphic concentrations; common medium faint grayish brown (2.5Y 5/2) redoximorphic depletions; slightly acid; clear smooth boundary.

C—65 to 80 inches; brown (10YR 5/3) silt loam; massive; friable; many very fine tubular pores; common fine distinct yellowish brown (10YR 5/6) redoximorphic concentrations; common medium faint grayish brown (2.5Y 5/2) redoximorphic depletions; 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—strongly acid to neutral

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam or silty clay
Reaction—strongly acid or moderately acid

BC and C horizons:
Hue—10YR
Value—5
Chroma—2 to 4
Texture—silty clay loam or silt loam
Reaction—moderately acid or slightly acid

Taxadjunct features: In this survey area, the severely eroded Ladoga soils and the severely eroded Ladoga soils on terraces do not have an epipedon that meets the criteria for the Mollic subgroup. These soils are classified as fine, smectitic, mixed, mesic Typic Hapludalfs.

Lamoni Series

Typical Pedon

Lamoni silty clay loam, in an area of Lamoni-Shelby complex, 9 to 14 percent slopes, moderately eroded, in a cultivated field; Adams County, Iowa; about 2,250 feet east and 2,400 feet north of the southwest corner of sec. 32, T. 72 N., R. 33 W.; USGS Corning South, Iowa, topographic quadrangle; lat. 40 degrees 59 minutes 29.2 seconds N. and long. 94 degrees 40 minutes 17.8 seconds W., NAD 83:

Ap—0 to 6 inches; about 70 percent black (10YR 2/1) and 30 percent dark grayish brown (10YR 4/2) silty clay loam mixings, gray (10YR 5/1) dry; moderate fine subangular blocky structure parting to weak very fine subangular blocky; friable; common very fine roots; common fine tubular pores; about 1 percent subrounded fine gravel; moderately acid; gradual smooth boundary.

2Btg1—6 to 9 inches; dark grayish brown (10YR 4/2) clay; moderate fine subangular blocky structure; firm; common very fine roots; common very fine tubular pores; common distinct dark gray (10YR 4/1) clay films; common distinct black (10YR 2/1) organic stains on surfaces along root channels; few fine distinct brown (7.5YR 4/4) redoximorphic concentrations; about 2 percent subrounded fine gravel; slightly acid; gradual smooth boundary.

2Btg2—9 to 16 inches; grayish brown (2.5Y 5/2) clay; moderate fine subangular blocky structure; firm; common very fine roots; common very fine pores; common distinct dark grayish brown (10YR 4/2) clay films; few distinct black (10YR 2/1) organic stains on surfaces along root channels; few fine prominent strong brown (7.5YR 4/6) redoximorphic concentrations; about 3 percent subrounded fine gravel; slightly acid; gradual smooth boundary.

2Bt1—16 to 23 inches; olive brown (2.5Y 4/3) clay; weak medium subangular blocky structure parting to moderate fine subangular blocky; firm; common very fine roots; common very fine pores; common distinct brown (10YR 5/3) clay films; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; about 3 percent subrounded fine and medium gravel; slightly acid; gradual smooth boundary.

2Bt2—23 to 29 inches; yellowish brown (10YR 5/4) clay loam; moderate fine prismatic structure parting to weak fine subangular blocky; firm; common very fine roots; common very fine pores; common distinct gray (10YR 5/1) and grayish brown (10YR 5/2) clay films; common fine prominent black (10YR 2/1) manganese masses; common fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; common fine distinct grayish brown (2.5Y 5/2) redoximorphic depletions; about 3 percent subrounded fine gravel; slightly acid; gradual smooth boundary.

2Bt3—29 to 42 inches; about 70 percent light brownish gray (2.5Y 6/2) and 30 percent yellowish brown (10YR 5/6) clay loam; weak fine prismatic structure parting to moderate fine subangular blocky; firm; common very fine pores; common distinct gray (2.5Y 5/1) clay films; few faint pinkish gray (7.5YR 6/2) redoximorphic concentrations; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; many medium prominent yellowish brown (10YR 5/8) redoximorphic concentrations; about 3 percent subrounded medium gravel; slightly acid; gradual smooth boundary.

2Bt4—42 to 55 inches; about 55 percent light brownish gray (2.5Y 6/2) and 45 percent yellowish brown (10YR 5/6) clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common very fine pores; common distinct brown (10YR 5/3) clay films; few fine prominent black (10YR 2/1) manganese masses; many medium prominent yellowish brown (10YR 5/8) redoximorphic concentrations; about 3 percent subrounded fine and medium gravel; neutral; gradual smooth boundary.

2BC—55 to 69 inches; about 60 percent light brownish gray (2.5Y 6/2) and 40 percent yellowish brown (10YR 5/6) clay loam; weak medium prismatic structure; firm; common very fine pores; few fine prominent black (10YR 2/1) manganese masses; many medium prominent yellowish brown (10YR 5/8) redoximorphic concentrations; about 3 percent subrounded fine and medium gravel; neutral; gradual smooth boundary.

2C—69 to 80 inches; light olive brown (2.5Y 5/4) clay loam; massive; firm; common very fine pores; few fine prominent white (10YR 8/1) carbonate masses; common fine distinct light brownish gray (2.5Y 6/2) redoximorphic depletions; common medium prominent strong brown (7.5YR 5/8) redoximorphic concentrations; about 3 percent subrounded fine and medium gravel; neutral.

Range in Characteristics

Depth to carbonates: More than 48 inches

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

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

2Bt horizon (lower part):
Hue—10YR to 5Y
Value—5 or 6
Chroma—1 to 6
Texture—clay loam
Reaction—strongly acid to neutral

2BC horizon:
Hue—10YR to 5Y
Value—5 or 6
Chroma—1 to 6
Texture—clay loam
Reaction—slightly acid or neutral

2C horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—1 to 6
Texture—clay loam
Reaction—slightly acid to slightly alkaline

Taxadjunct features: The moderately eroded and severely eroded Lamoni soils in this survey area do not have a mollic epipedon. These soils are classified as fine, smectitic, mesic Vertic Epiaqualfs.

Macksburg Series

Typical Pedon

Macksburg silty clay loam, 0 to 2 percent slopes, in a cultivated field in the uplands; Adams County, Iowa; about 125 feet east and 500 feet north of the southwest corner of sec. 6, T. 71 N., R. 32 W.; USGS Lenox, Iowa, topographic quadrangle; lat. 40 degrees 58 minutes 22.4 seconds N. and long. 94 degrees 35 minutes 05.9 seconds W., NAD 83:

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

A—7 to 16 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate very fine subangular blocky structure parting to moderate fine granular; friable; common fine roots; many very fine tubular pores; slightly acid; clear smooth boundary.

BA—16 to 22 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; friable; common very fine roots; many very fine tubular pores; moderately acid; clear smooth boundary.

Bt1—22 to 30 inches; about 70 percent dark grayish brown (2.5Y 4/2) and 30 percent olive brown (2.5Y 4/3) silty clay loam; moderate fine prismatic structure parting to moderate fine and very fine subangular blocky; firm; common very fine roots; many very fine tubular pores; many distinct very dark grayish brown (2.5Y 3/2) clay films on vertical faces of peds; moderately acid; gradual smooth boundary.

Bt2—30 to 37 inches; about 50 percent grayish brown (2.5Y 5/2) and 50 percent light olive brown (2.5Y 5/4) silty clay; moderate medium prismatic structure parting to moderate fine and very fine subangular blocky; firm; common very fine roots; many very fine tubular pores; many distinct dark grayish brown (2.5Y 4/2) clay films on vertical faces of peds; common fine and medium prominent strong brown (7.5YR 4/6) redoximorphic concentrations; moderately acid; clear smooth boundary.

Btg1—37 to 46 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common fine roots; many very fine tubular pores; few distinct dark grayish brown (2.5Y 4/2) clay films on vertical faces of peds; common fine prominent strong brown (7.5YR 4/6) redoximorphic concentrations; slightly acid; gradual smooth boundary.

Btg2—46 to 55 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; friable; many very fine tubular pores; few distinct dark grayish brown (2.5Y 4/2) clay films on vertical faces of peds; few strong brown (7.5YR 5/6) redoximorphic concentrations; neutral; gradual smooth boundary.

BCg—55 to 64 inches; grayish brown (2.5Y 5/2) silty clay loam; weak medium prismatic structure; friable; many very fine tubular pores; many medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations; neutral; gradual smooth boundary.

Cg1—64 to 71 inches; grayish brown (2.5Y 5/2) silty clay loam; massive; friable; many very fine pores; many medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations; neutral; gradual wavy boundary.

Cg2—71 to 80 inches; light brownish gray (2.5Y 6/2) silt loam; massive; friable; many very fine tubular pores; many medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 28 inches
Depth to carbonates: More than 60 inches

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

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

Bt or Btg horizon:
Hue—10YR or 2.5Y in the upper part; 2.5Y or 5Y in the lower part
Value—4 to 6
Chroma—2 to 4
Texture—silty clay or silty clay loam
Reaction—strongly acid to neutral

BCg horizon:
Hue—7.5YR to 5Y
Value—4 to 6
Chroma—1 to 6
Texture—silty clay loam
Reaction—slightly acid or neutral

Cg horizon:
Hue—7.5YR to 5Y
Value—4 to 6
Chroma—1 to 6
Texture—silty clay loam or silt loam
Reaction—slightly acid or neutral

Mt. Sterling Series

Typical Pedon

Mt. Sterling silt loam, in an area of Zook-Mt. Sterling complex, 0 to 2 percent slopes, occasionally flooded, in a cultivated field on a flood plain; Adams County, Iowa; about 2,450 feet east and 1,250 feet south of the northwest corner of sec. 21, T. 73 N., R. 34 W.; USGS Carbon, Iowa, topographic quadrangle; lat. 41 degrees 06 minutes 44 seconds N. and long. 94 degrees 46 minutes 03 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 very fine roots; common very fine tubular pores; neutral; clear smooth boundary.

C—8 to 37 inches; about 80 percent stratified very dark gray (10YR 3/1) and 20 percent dark grayish brown (10YR 4/2) silt loam; massive with weak thin alluvial stratification; common very fine roots; common very fine tubular pores; many medium prominent dark brown (7.5YR 3/4) redoximorphic concentrations; neutral; clear smooth boundary.

Ab1—37 to 42 inches; black (N 2/) silty clay loam; moderate fine subangular blocky structure; firm; few very fine roots; common very fine tubular pores; neutral; gradual smooth boundary.

Ab2—42 to 54 inches; black (N 2/) silty clay loam; moderate medium subangular blocky structure; firm; few very fine roots; many very fine tubular pores; neutral; gradual smooth boundary.

Ab3—54 to 62 inches; black (N 2/) silty clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; few very fine roots; many very fine tubular pores; neutral; gradual smooth boundary.

Ab4—62 to 80 inches; very dark gray (10YR 3/1) silty clay loam; moderate medium prismatic structure; firm; few very fine roots; many very fine tubular pores; neutral.

Range in Characteristics

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

C horizon:
Hue—10YR
Value—2 to 6
Chroma—1 or 2
Texture—silt loam
Reaction—strongly acid to moderately alkaline

Ab horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam
Reaction—moderately acid to slightly alkaline

Nevin Series

Typical Pedon

Nevin silt loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field on a stream terrace; Adams County, Iowa; about 380 feet west and 250 feet south of the northeast corner of sec. 31, T. 71 N., R. 35 W.; USGS Villisca, Iowa, topographic quadrangle; lat. 40 degrees 54 minutes 52.9 seconds N. and long. 94 degrees 54 minutes 45.7 seconds W., NAD 83:

Ap—0 to 7 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; common very fine roots; common very fine tubular pores; slightly acid; abrupt smooth boundary.

A1—7 to 15 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak fine and medium granular structure; friable; common very fine roots; common very fine tubular pores; moderately acid; gradual smooth boundary.

A2—15 to 22 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure parting to weak fine granular; friable; common very fine roots; common very fine tubular pores; moderately acid; clear smooth boundary.

BA—22 to 30 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate very fine subangular blocky structure; friable; common very fine roots; common very fine tubular pores; many distinct very dark gray (10YR 3/1) organic stains on vertical faces of peds; moderately acid; gradual smooth boundary.

Btg1—30 to 37 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; common very fine tubular pores; common distinct dark grayish brown (10YR 4/2) clay films on vertical faces of peds; common distinct very dark grayish brown (10YR 3/2) organic stains on vertical faces of peds; common fine distinct light olive brown (2.5Y 5/4) redoximorphic concentrations on faces of peds; moderately acid; gradual smooth boundary.

Btg2—37 to 43 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine tubular pores; common distinct dark grayish brown (10YR 4/2) clay films on vertical faces of peds; common fine distinct light olive brown (2.5Y 5/4) redoximorphic concentrations on faces of peds; moderately acid; gradual smooth boundary.

Btg3—43 to 53 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate coarse prismatic structure parting to weak medium subangular blocky; friable; common very fine tubular pores; few distinct dark grayish brown (10YR 4/2) clay films on vertical faces of peds; few distinct very dark grayish brown (10YR 3/2) organic stains on vertical faces of peds; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations on faces of peds; slightly acid; gradual smooth boundary.

BCg—53 to 63 inches; grayish brown (2.5Y 5/2) silty clay loam; weak coarse prismatic structure; friable; common very fine tubular pores; few distinct very dark grayish brown (10YR 3/2) organic stains on vertical faces of peds; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations on faces of peds; slightly acid; clear smooth boundary.

Cg—63 to 80 inches; grayish brown (2.5Y 5/2) silty clay loam; massive; friable; common very fine tubular pores; many fine and medium prominent yellowish brown (10YR 5/8) redoximorphic concentrations on faces of peds; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 36 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—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

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

Cg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 to 4
Texture—silty clay loam or silt loam
Reaction—slightly acid or neutral

Nira Series

Typical Pedon

Nira silty clay loam, in an area of Sharpsburg-Nira complex, 5 to 9 percent slopes, moderately eroded, in a cultivated field in the uplands; Adams County, Iowa; about 1,765 feet east and 370 feet north of the southwest corner of sec. 11, T. 73 N., R. 33 W.; USGS Nevinville, Iowa, topographic quadrangle; lat. 41 degrees 07 minutes 51 seconds N. and long. 94 degrees 37 minutes 05 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 granular structure; friable; common medium roots; common fine tubular pores; slightly acid; abrupt smooth boundary.

A—8 to 15 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; common fine roots; many fine tubular pores; many distinct very dark gray (10YR 3/1) organic stains on vertical faces of peds; slightly acid; clear wavy boundary.

Bt1—15 to 21 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine prismatic structure parting to moderate very fine subangular blocky; friable; common very fine roots; many fine tubular pores; few distinct brown (10YR 4/3) clay films on vertical faces of peds; few distinct very dark grayish brown (10YR 3/2) organic stains on vertical faces of peds; slightly acid; clear smooth boundary.

Bt2—21 to 26 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine prismatic structure parting to moderate fine subangular blocky; friable; common very fine roots; many fine tubular pores; few distinct brown (10YR 4/3) clay films on vertical faces of peds; few fine distinct grayish brown (2.5Y 5/2) redoximorphic depletions; slightly acid; abrupt wavy boundary.

Bg1—26 to 33 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; friable; common fine roots; many fine tubular pores; common prominent strong brown (7.5YR 4/6) root fills 1 centimeter in diameter; few fine distinct irregular black (10YR 2/1) iron-manganese masses; common medium prominent yellowish red (5YR 5/6) redoximorphic concentrations; many medium and coarse prominent strong brown (7.5YR 5/6) redoximorphic concentrations; slightly acid; gradual smooth boundary.

Bg2—33 to 41 inches; grayish brown (2.5Y 5/2) silty clay loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; common fine roots; common fine tubular pores; many medium and coarse prominent strong brown (7.5YR 5/6) redoximorphic concentrations; neutral; abrupt smooth boundary.

BCg—41 to 50 inches; grayish brown (2.5Y 5/2) silty clay loam; weak coarse prismatic structure; friable; common fine tubular pores; common medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations; neutral; abrupt wavy boundary.

Cg1—50 to 62 inches; grayish brown (2.5Y 5/2) silt loam; massive; friable; common fine tubular pores; common medium and coarse prominent strong brown (7.5YR 5/6) redoximorphic concentrations; neutral; gradual smooth boundary.

Cg2—62 to 80 inches; grayish brown (2.5Y 5/2) silt loam; massive; friable; common fine tubular pores; common coarse prominent strong brown (7.5YR 5/6) redoximorphic concentrations; neutral.

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—silty clay loam
Reaction—moderately acid to neutral

Bt horizon:
Hue—10YR
Value—4
Chroma—3 or 4
Texture—silty clay loam
Reaction—moderately acid or slightly acid

Bg horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—silty clay loam
Reaction—moderately 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 or neutral

Taxadjunct features: The moderately eroded and severely eroded Nira soils in this survey area do not have a mollic epipedon. These soils are classified as fine-silty, mixed, superactive, mesic Oxyaquic Dystrudepts.

Nodaway Series

Typical Pedon

Nodaway silt loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field on a flood plain; Adams County, Iowa; about 2,270 feet west and 375 feet north of the southeast corner of sec. 17, T. 71 N., R. 35 W.; USGS Villisca, Iowa, topographic quadrangle; lat. 40 degrees 56 minutes 43.7 seconds N. and long. 94 degrees 53 minutes 53.9 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; common fine roots; common very fine tubular pores; moderately acid; abrupt smooth boundary.

C1—8 to 32 inches; about 95 percent very dark brown (10YR 2/2) silt loam stratified with about 5 percent grayish brown (10YR 5/2) silt loam; massive; friable; common very fine roots; many very fine tubular pores; slightly acid; gradual smooth boundary.

C2—32 to 80 inches; about 95 percent very dark grayish brown (10YR 3/2) silt loam stratified with about 5 percent grayish brown (10YR 5/2) silt loam; massive; friable; common fine roots; few very fine tubular pores; neutral.

Range in Characteristics

Ap or A horizon:

Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt 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 or stratified with these textures
Reaction—slightly acid or neutral

Olmitz Series

Typical Pedon

Olmitz loam, 2 to 5 percent slopes, in a cultivated field on an alluvial fan; Adams County, Iowa; about 1,640 feet east and 630 feet south of the northwest corner of sec. 30, T. 71 N., R. 35 W.; USGS Villisca, Iowa, topographic quadrangle; lat. 40 degrees 55 minutes 41 seconds N. and long. 94 degrees 55 minutes 16 seconds W., NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; common fine roots; common fine tubular pores; moderately acid; abrupt smooth boundary.

A1—8 to 17 inches; black (10YR 2/1) clay loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure parting to moderate medium granular; friable; common fine roots; common very fine tubular pores; slightly acid; gradual smooth boundary.

A2—17 to 27 inches; very dark brown (10YR 2/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; friable; common very fine roots; common very fine tubular pores; very many distinct black (10YR 2/1) organic stains on vertical faces of peds; neutral; gradual smooth boundary.

A3—27 to 34 inches; very dark grayish brown (10YR 3/2) clay loam, grayish brown (10YR 5/2) dry; moderate fine prismatic structure parting to moderate fine subangular blocky; friable; many very fine roots; common very fine tubular pores;

very many distinct very dark brown (10YR 2/2) organic stains on vertical faces of peds; neutral; gradual wavy boundary.

Bw1—34 to 42 inches; dark brown (10YR 3/3) clay loam, brown (10YR 5/3) dry; moderate medium prismatic structure parting to moderate fine subangular blocky; friable; common very fine roots; common medium tubular pores; many distinct very dark brown (10YR 2/2) organic stains on vertical faces of peds; neutral; gradual smooth boundary.

Bw2—42 to 54 inches; brown (10YR 4/3) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; common very fine roots; common very fine tubular pores; common distinct dark brown (10YR 3/3) organic stains on vertical faces of peds; neutral; gradual smooth boundary.

Bw3—54 to 67 inches; brown (10YR 4/3) clay loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; common very fine tubular pores; few distinct dark brown (10YR 3/3) organic stains on vertical faces of peds; neutral; gradual smooth boundary.

BC—67 to 80 inches; brown (10YR 4/3) clay loam; weak coarse prismatic structure; friable; common very fine tubular pores; common fine faint dark yellowish brown (10YR 4/4) redoximorphic concentrations on faces of peds; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 40 to 60 inches
Depth to carbonates: More than 60 inches

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

Bw horizon:
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—clay loam
Reaction—strongly acid to neutral

BC horizon:
Hue—10YR
Value—4
Chroma—2 or 3
Texture—loam or clay loam
Reaction—strongly acid to neutral

Rinda Series

Typical Pedon

Rinda silt loam, 5 to 9 percent slopes, in a pasture; Lee County, Iowa; about 1 mile north and 4 miles west of Primrose; about 650 feet east and 1,600 feet north of the southwest corner of sec. 18, T. 68 N., R. 7 W.; USGS Farmington, Iowa, topographic quadrangle; lat. 40 degrees 41 minutes 13 seconds N. and long. 91 degrees 42 minutes 55 seconds W., NAD 27:

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; common fine prominent brown (7.5YR 4/4) redoximorphic concentrations; neutral; clear smooth boundary.

E—7 to 13 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; common distinct silt coatings on faces of peds; few fine faint very dark gray (10YR 3/1) organic coatings on faces of peds and in pores; common fine prominent reddish brown (5YR 4/4) redoximorphic concentrations; slightly acid; clear smooth boundary.

BE—13 to 17 inches; dark grayish brown (10YR 4/2) silty clay loam; strong fine subangular blocky structure; firm; many distinct silt coatings on faces of peds; few fine distinct light olive brown (2.5Y 5/6) and yellowish red (5YR 5/6) redoximorphic concentrations; moderately acid; abrupt smooth boundary.

2Btg1—17 to 23 inches; dark grayish brown (10YR 4/2) silty clay; moderate fine subangular blocky structure; very firm; common distinct dark gray (10YR 4/1) clay films on faces of peds; common fine distinct olive brown (2.5Y 4/4) redoximorphic concentrations; moderately acid; gradual smooth boundary.

2Btg2—23 to 30 inches; dark grayish brown (2.5Y 4/2) silty clay; moderate medium subangular blocky structure; very firm; many distinct dark gray (10YR 4/1) clay films on faces of peds; few fine prominent reddish brown (5YR 4/4) redoximorphic concentrations; few pebbles $^{1}/_{4}$ to $^{1}/_{2}$ inch in diameter; few carbonate nodules 1 inch in diameter; slightly acid; gradual smooth boundary.

2Btg3—30 to 38 inches; dark grayish brown (2.5Y 4/2) silty clay; weak medium subangular blocky structure; very firm; many distinct dark gray (10YR 4/1) clay films on faces of peds; few fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; common fine prominent gray (10YR 5/1) redoximorphic depletions; neutral; gradual smooth boundary.

2Btg4—38 to 48 inches; gray (10YR 5/1) silty clay; weak medium subangular blocky structure; very firm; few distinct dark gray (10YR 4/1) clay films on faces of peds; few carbonate nodules 1 to 1$^{1}/_{2}$ inches in diameter; many medium prominent yellowish brown (10YR 5/6) and few medium prominent yellowish red (5YR 5/6) redoximorphic concentrations; neutral; gradual smooth boundary.

2Btg5—48 to 70 inches; mottled dark gray (5Y 4/1) and gray (5Y 5/1) silty clay; weak medium subangular blocky structure; firm; few distinct dark gray (10YR 4/1) clay films on faces of peds; few fine prominent yellowish red (5YR 5/6) redoximorphic concentrations; neutral; gradual smooth boundary.

2Btg6—70 to 80 inches; mottled dark gray (5Y 4/1) and gray (5Y 5/1) silty clay; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few faint dark gray (10YR 4/1) clay films on faces of peds; many medium and coarse prominent yellowish red (5YR 5/6) redoximorphic concentrations; neutral.

Range in Characteristics

Ap or A horizon:

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

E horizon (where present):

Hue—10YR
Value—4 or 5
Chroma—2
Texture—silt loam
Reaction—moderately acid to neutral

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

Btg horizon (where present):
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam or silty clay
Reaction—strongly acid to neutral

2Btg horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay or clay
Reaction—moderately acid to slightly alkaline

Sharpsburg Series

Typical Pedon

Sharpsburg silty clay loam, 2 to 5 percent slopes, in a cultivated field in the uplands; Adams County, Iowa; about 885 feet west and 250 feet south of the northeast corner of sec. 36, T. 71 N., R. 34 W.; USGS Corning South, Iowa, topographic quadrangle; lat. 40 degrees 54 minutes 48 seconds N. and long. 94 degrees 42 minutes 11 seconds W., NAD 83:

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

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

A2—14 to 20 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; friable; common fine roots; common very fine tubular pores; very many distinct very dark brown (10YR 2/2) organic stains on vertical faces of peds; moderately acid; clear wavy boundary.

Bt1—20 to 25 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; firm; common very fine roots; common very fine tubular pores; common distinct dark brown (10YR 3/3) clay films on vertical faces of peds; common distinct very dark grayish brown (10YR 3/2) organic stains on vertical faces of peds; moderately acid; gradual smooth boundary.

Bt2—25 to 31 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine prismatic structure parting to moderate very fine and fine subangular blocky; firm; common very fine roots; common very fine tubular pores; many distinct brown (10YR 4/3) clay films on vertical faces of peds; few distinct very dark grayish brown (10YR 3/2) organic stains on vertical faces of peds; few fine distinct light brownish gray (2.5Y 6/2) redoximorphic depletions; moderately acid; clear smooth boundary.

Bt3—31 to 38 inches; brown (10YR 5/3) silty clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; friable; common very fine roots; common very fine tubular pores; many distinct dark yellowish brown (10YR 4/4) clay films on vertical faces of peds; common fine distinct yellowish brown (10YR 5/6) redoximorphic concentrations; common fine faint light brownish gray (2.5Y 6/2) redoximorphic depletions on faces of peds; moderately acid; gradual smooth boundary.

Bt4—38 to 48 inches; light olive brown (2.5Y 5/3) silty clay loam; moderate medium prismatic structure parting to weak medium subangular blocky; friable; common very fine roots; common very fine tubular pores; few distinct dark yellowish brown (10YR 4/4) clay films on vertical faces of peds; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; common fine faint light brownish gray (2.5Y 6/2) redoximorphic depletions; moderately acid; gradual smooth boundary.

Btg—48 to 57 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium prismatic structure parting to weak medium and coarse subangular blocky; friable; common very fine roots; common very fine tubular pores; few distinct dark yellowish brown (10YR 4/4) clay films on vertical faces of peds; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly acid; gradual smooth boundary.

BCg—57 to 65 inches; grayish brown (2.5Y 5/2) silty clay loam; weak coarse prismatic structure; friable; many very fine tubular pores; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly acid; gradual smooth boundary.

Cg—65 to 80 inches; grayish brown (2.5Y 5/2) silt loam; massive; friable; many very fine tubular pores; many fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; neutral.

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 to 3
Texture—silty clay loam
Reaction—strongly acid to slightly acid

Bt horizon (upper part):
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silty clay or silty clay loam
Reaction—strongly acid to slightly acid

Bt horizon (lower part):
Hue—7.5YR to 5Y
Value—4 to 6
Chroma—2 to 6
Texture—silty clay loam
Reaction—moderately acid or slightly acid

BC horizon:
Hue—7.5YR to 5Y
Value—4 to 6
Chroma—2 to 6
Texture—silty clay loam
Reaction—slightly acid or neutral

C or Cg horizon:
Hue—7.5YR to 5Y
Value—4 to 6
Chroma—2 to 6
Texture—silty clay loam or silt loam
Reaction—slightly acid or neutral

Taxadjunct features: In this survey area, the moderately eroded Sharpsburg soils and the moderately eroded Sharpsburg soils on terraces have a thinner dark surface layer than is defined as the range for the series. These soils are classified as fine, smectitic, mesic Mollic Hapludalfs. Also, the severely eroded Sharpsburg soils and the severely eroded Sharpsburg soils on terraces do not have a mollic epipedon. These soils are classified as fine, smectitic, mesic Typic Hapludalfs.

Shelby Series

Typical Pedon

Shelby clay loam, in an area of Lamoni-Shelby complex, 9 to 14 percent slopes, moderately eroded, in a cultivated field in the uplands; Adams County, Iowa; about 1,900 feet west and 2,460 feet north of the southeast corner of sec. 33, T. 72 N., R. 32 W.; USGS Lenox, Iowa, topographic quadrangle; lat. 40 degrees 59 minutes 33 seconds N. and long. 94 degrees 32 minutes 06 seconds W., NAD 83:

Ap—0 to 7 inches; about 80 percent very dark grayish brown (10YR 3/2) and 20 percent brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) dry; weak very fine subangular blocky structure; friable; common fine roots; common very fine pores; very many distinct very dark gray (10YR 3/1) organic stains on faces of peds; neutral; abrupt smooth boundary.

Bt1—7 to 15 inches; about 85 percent brown (10YR 5/3) and 15 percent yellowish brown (10YR 5/4) clay loam; moderate fine subangular blocky structure; firm; common fine roots; common fine pores; many distinct brown (10YR 4/3) clay films on vertical faces of peds; about 2 percent subrounded gravel; slightly acid; clear smooth boundary.

Bt2—15 to 23 inches; yellowish brown (10YR 5/4) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; common fine pores; common distinct dark yellowish brown (10YR 4/4) clay films on vertical faces of peds; common fine distinct yellowish brown (10YR 5/6) redoximorphic concentrations; common fine distinct grayish brown (2.5Y 5/2) redoximorphic depletions; about 2 percent subrounded gravel; slightly acid; gradual smooth boundary.

Bt3—23 to 31 inches; yellowish brown (10YR 5/4) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine roots; common very fine pores; common distinct dark yellowish brown (10YR 4/4) clay films on vertical faces of peds; few fine distinct very dark brown (10YR 2/2) iron-manganese masses; common medium distinct yellowish brown (10YR 5/6) redoximorphic concentrations; common fine distinct grayish brown

(2.5Y 5/2) redoximorphic depletions; about 1 percent subrounded gravel; neutral; clear wavy boundary.

Bk1—31 to 40 inches; yellowish brown (10YR 5/4) clay loam; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; common very fine pores; common fine distinct weakly cemented very dark brown (10YR 2/2) iron-manganese masses; few medium prominent spherical white (10YR 8/1) carbonate concretions; common fine distinct yellowish brown (10YR 5/6) redoximorphic concentrations; common medium distinct grayish brown (2.5Y 5/2) redoximorphic depletions; about 3 percent subrounded gravel; moderately alkaline; gradual smooth boundary.

Bk2—40 to 48 inches; yellowish brown (10YR 5/4) clay loam; weak coarse prismatic structure; firm; common very fine pores; common fine distinct very dark brown (10YR 2/2) iron-manganese masses; few fine prominent white (10YR 8/1) carbonate masses; common medium distinct yellowish brown (10YR 5/6) redoximorphic concentrations; common medium distinct grayish brown (2.5Y 5/2) redoximorphic depletions; about 4 percent rounded gravel; moderately alkaline; clear smooth boundary.

C1—48 to 55 inches; yellowish brown (10YR 5/4) clay loam; massive; firm; common very fine pores; common fine distinct very dark brown (10YR 2/2) iron-manganese masses; few fine prominent white (10YR 8/1) carbonate masses; common medium and coarse distinct grayish brown (2.5Y 5/2) redoximorphic depletions; about 4 percent subrounded gravel; slightly alkaline; clear smooth boundary.

C2—55 to 80 inches; yellowish brown (10YR 5/4) clay loam; massive; firm; common very fine pores; common fine distinct very dark brown (10YR 2/2) iron-manganese masses; very few fine prominent white (10YR 8/1) carbonate masses; common fine distinct grayish brown (2.5Y 5/2) redoximorphic depletions; about 4 percent subrounded gravel; slightly alkaline.

Range in Characteristics

Depth to carbonates: More than 30 inches

Ap or A horizon:
Hue—10YR
Value—2 to 5
Chroma—1 to 3
Texture—clay loam or loam
Reaction—strongly acid to neutral

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

Bk horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 6
Texture—clay loam or loam
Reaction—slightly alkaline or moderately alkaline

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6

Chroma—2 to 6
Texture—clay loam or loam
Reaction—neutral to moderately alkaline

Taxadjunct features: The moderately eroded Shelby soils in this survey area have a thinner dark surface layer than is defined as the range for the series. These soils are classified as fine-loamy, mixed, superactive, mesic Mollic Hapludalfs. Also, the severely eroded Shelby soils in this survey area do not have a mollic epipedon. These soils are classified as fine-loamy, mixed, superactive, mesic Typic Hapludalfs.

Vesser Series

Typical Pedon

Vesser silt loam, 0 to 2 percent slopes, in a cultivated field on a flood plain; Wayne County, Iowa; about 875 feet west and 2,100 feet north of the southeast corner of sec. 5, T. 69 N., R. 21 W.; USGS Corydon, Iowa, topographic quadrangle; lat. 40 degrees 48 minutes 07 seconds N. and long. 93 degrees 17 minutes 04 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 horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—1 or 2
Texture—silty clay loam
Reaction—strongly acid or moderately acid

BCg horizon:
Hue—10YR
Value—3 or 4
Chroma—1
Texture—silty clay loam
Reaction—moderately acid

Wabash Series

Typical Pedon

Wabash silty clay loam, occasionally ponded, 0 to 2 percent slopes, occasionally flooded, in a cultivated field on a flood plain; Adams County, Iowa; about 90 feet east and 160 feet north of the southwest corner of sec. 32, T. 71 N., R. 35 W.; USGS Villisca, Iowa, topographic quadrangle; lat. 40 degrees 54 minutes 04 seconds N. and long. 94 degrees 54 minutes 36 seconds W., NAD 83:

Ap—0 to 7 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; firm; common very fine roots; common very fine tubular pores; neutral; abrupt smooth boundary.

A1—7 to 15 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; firm; common medium roots; common fine tubular pores; slightly acid; clear smooth boundary.

A2—15 to 27 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; moderate fine prismatic structure parting to moderate fine subangular blocky; very firm; common fine roots; common very fine tubular pores; moderately acid; gradual smooth boundary.

A3—27 to 36 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; strong medium prismatic structure parting to strong fine subangular blocky; very firm; common very fine tubular pores; common fine distinct dark grayish brown (2.5Y 4/2) redoximorphic depletions; moderately acid; gradual smooth boundary.

Bg1—36 to 45 inches; very dark gray (10YR 3/1) silty clay; strong medium prismatic structure parting to strong fine and medium subangular blocky; very firm; common very fine tubular pores; common fine faint dark grayish brown (2.5Y 4/2) redoximorphic depletions; moderately acid; gradual smooth boundary.

Bg2—45 to 54 inches; very dark gray (10YR 3/1) silty clay; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; common fine tubular pores; common fine faint dark grayish brown (2.5Y 4/2) redoximorphic depletions; slightly acid; gradual smooth boundary.

Bg3—54 to 65 inches; very dark gray (10YR 3/1) silty clay; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine tubular pores; common fine faint dark grayish brown (2.5Y 4/2) redoximorphic depletions; slightly acid; clear smooth boundary.

BCg—65 to 80 inches; dark gray (10YR 4/1) silty clay; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; common very fine tubular pores; common fine prominent yellowish brown (10YR 5/6) masses of oxidized iron; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 36 to 45 inches
Depth to carbonates: More than 40 inches

Ap or A horizon:
Hue—10YR to 5Y or N
Value—2 or 3
Chroma—0 to 2
Texture—silty clay loam or silty clay
Reaction—strongly acid to neutral

Bg horizon:
Hue—10YR to 5Y or N
Value—2 to 5
Chroma—0 to 2
Texture—silty clay or clay
Reaction—strongly acid to neutral

BCg horizon and Cg horizon (if present):
Hue—10YR to 5Y or N
Value—2 to 5
Chroma—0 to 2
Texture—silty clay or clay
Reaction—strongly acid to slightly alkaline

Winterset Series

Typical Pedon

Winterset silty clay loam, 0 to 2 percent slopes, in a cultivated field in the uplands; Adams County, Iowa; about 75 feet west and 1,010 feet north of the southeast corner of sec. 1, T. 71 N., R. 33 W.; USGS Lenox, Iowa, topographic quadrangle; lat. 40 degrees 58 minutes 25.9 seconds N. and long. 94 degrees 35 minutes 09.2 seconds W., NAD 83:

Ap—0 to 7 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 high-continuity tubular pores; neutral; abrupt smooth boundary.

A1—7 to 15 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; common very fine roots; common fine tubular pores; moderately acid; clear smooth boundary.

A2—15 to 22 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate very fine subangular blocky structure; friable; common very fine roots; many very fine tubular pores; common fine faint dark grayish brown (10YR 4/2) redoximorphic depletions; slightly acid; clear smooth boundary.

Btg1—22 to 28 inches; dark grayish brown (2.5Y 4/2) silty clay; moderate fine prismatic structure parting to moderate very fine subangular blocky; firm; common very fine roots; many very fine tubular pores; many distinct very dark grayish brown (2.5Y 3/2) clay films on vertical faces of peds; common fine distinct light olive brown (2.5Y 5/4) redoximorphic concentrations; slightly acid; gradual smooth boundary.

Btg2—28 to 37 inches; grayish brown (2.5Y 5/2) silty clay; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common fine and very fine roots; common very fine tubular pores; many distinct dark grayish brown (2.5Y 4/2) clay films on vertical faces of peds; common fine prominent strong brown (7.5YR 4/6) redoximorphic concentrations; slightly acid; clear smooth boundary.

Btg3—37 to 45 inches; grayish brown (2.5Y 5/2) silty clay; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine roots; common very fine tubular pores; common distinct dark grayish brown (2.5Y 4/2) clay films on vertical faces of peds; common medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations; slightly acid; gradual smooth boundary.

Btg4—45 to 55 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; common very fine roots; common very fine tubular pores; few distinct dark grayish brown (2.5Y 4/2) clay films on vertical faces of peds; common medium prominent strong brown (7.5YR 5/6) and common medium distinct light olive brown (2.5Y 5/4) redoximorphic concentrations; neutral; gradual smooth boundary.

BCg—55 to 66 inches; light brownish gray (2.5Y 6/2) silty clay loam; weak coarse prismatic structure; friable; common very fine tubular pores; common medium prominent strong brown (7.5YR 4/6 and 5/6) redoximorphic concentrations; neutral; abrupt smooth boundary.

Cg—66 to 80 inches; about 60 percent light brownish gray (2.5Y 6/2) and 40 percent light olive brown (2.5Y 5/6) silty clay loam; friable; common very fine tubular pores; common fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; neutral.

Range in Characteristics

Depth to carbonates: More than 60 inches

Ap or A horizon:
Hue—10YR or N
Value—2
Chroma—0 or 1
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

Btg horizon:
Hue—10YR to 5Y
Value—3 to 5
Chroma—1 or 2

Texture—silty clay loam or silty clay
Reaction—moderately acid to neutral

BCg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam
Reaction—slightly acid or neutral

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—slightly acid or neutral

Wiota Series

Typical Pedon

Wiota silty clay loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field on a stream terrace; Adams County, Iowa; about 2,145 feet east and 200 feet south of the northwest corner of sec. 27, T. 73 N., R. 34 W.; USGS Corning North, Iowa, topographic quadrangle; lat. 41 degrees 06 minutes 02 seconds N. and long. 94 degrees 44 minutes 55 seconds W., NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; many fine roots; common fine tubular pores; strongly acid; abrupt smooth boundary.

A1—8 to 15 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak very fine and fine granular structure; friable; common very fine roots; many very fine tubular pores; strongly acid; gradual smooth boundary.

A2—15 to 22 inches; very dark grayish brown (10YR 3/2) silty clay loam, gray (10YR 5/1) dry; moderate very fine subangular blocky structure; friable; common very fine roots; many very fine tubular pores; very many distinct very dark gray (10YR 3/1) organic stains on vertical faces of peds; moderately acid; gradual smooth boundary.

AB—22 to 28 inches; about 80 percent very dark grayish brown (10YR 3/2) and 20 percent dark brown (10YR 3/3) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; friable; common very fine roots; common very fine tubular pores; common distinct very dark gray (10YR 3/1) organic stains on vertical faces of peds; moderately acid; gradual smooth boundary.

Bt1—28 to 38 inches; brown (10YR 4/3) silty clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; friable; common very fine roots; common very fine tubular pores; common distinct dark brown (10YR 3/3) clay films on vertical faces of peds; moderately acid; gradual smooth boundary.

Bt2—38 to 48 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; common very fine roots; common very fine tubular pores; common distinct brown (10YR 4/3) clay films on vertical faces of peds; moderately acid; gradual smooth boundary.

Bt3—48 to 59 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate coarse prismatic structure parting to moderate coarse subangular blocky; friable;

common fine roots; common very fine tubular pores; common distinct brown (10YR 4/3) clay films on vertical faces of peds; common fine distinct grayish brown (10YR 5/2) redoximorphic depletions; moderately acid; gradual smooth boundary.

BC—59 to 70 inches; yellowish brown (10YR 5/4) silt loam; weak coarse prismatic structure; friable; common very fine tubular pores; common fine distinct grayish brown (10YR 5/2) redoximorphic depletions; moderately acid; clear smooth boundary.

C—70 to 80 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; common very fine tubular pores; many medium distinct grayish brown (2.5Y 5/2) redoximorphic depletions; moderately acid.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 32 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—strongly acid to neutral

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

BC or C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 to 6
Texture—silt loam or silty clay loam
Reaction—moderately acid or slightly acid

2C horizon (where present):
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 to 6
Texture—sandy loam, loamy sand, fine sand, or sand or the gravelly analogs of these textures
Reaction—slightly acid or neutral

Zook Series

Typical Pedon

Zook silty clay loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field on a flood plain; Adams County, Iowa; about 1,075 feet east and 250 feet south of the northwest corner of sec. 16, T. 72 N., R. 34 W.; USGS Carbon, Iowa, topographic quadrangle; lat. 41 degrees 02 minutes 17 seconds N. and long. 94 degrees 46 minutes 04 seconds W., NAD 83:

Ap—0 to 7 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; common fine roots; common very fine vesicular pores; neutral; abrupt smooth boundary.

A1—7 to 12 inches; black (10YR 2/1) silty clay loam, black (N 2/) exterior, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; common fine roots; common very fine vesicular pores; neutral; clear smooth boundary.

A2—12 to 22 inches; black (10YR 2/1) silty clay, black (N 2/) exterior, very dark gray (10YR 3/1) dry; moderate fine prismatic structure parting to moderate fine and very fine subangular blocky; firm; common fine roots; common very fine vesicular pores; neutral; gradual smooth boundary.

A3—22 to 31 inches; black (10YR 2/1) silty clay, black (N 2/) exterior, very dark gray (10YR 3/1) dry; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; common fine roots; common very fine vesicular pores; few fine distinct dark grayish brown (2.5Y 4/2) redoximorphic depletions; neutral; gradual smooth boundary.

Bg1—31 to 40 inches; very dark gray (10YR 3/1) silty clay; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common very fine roots; common very fine vesicular pores; many distinct black (10YR 2/1) organic stains on vertical faces of peds; common fine faint dark grayish brown (2.5Y 4/2) redoximorphic depletions; neutral; gradual smooth boundary.

Bg2—40 to 51 inches; very dark gray (10YR 3/1) silty clay; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common very fine roots; common very fine vesicular pores; many distinct black (10YR 2/1) organic stains on vertical faces of peds; common fine faint dark grayish brown (2.5Y 4/2) redoximorphic depletions; neutral; gradual smooth boundary.

Bg3—51 to 60 inches; very dark gray (10YR 3/1) silty clay; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine roots; common very fine vesicular pores; many distinct black (10YR 2/1) organic stains on vertical faces of peds; common fine faint dark grayish brown (2.5Y 4/2) redoximorphic depletions; neutral; gradual smooth boundary.

Bg4—60 to 72 inches; very dark gray (10YR 3/1) silty clay; strong medium prismatic structure parting to moderate medium subangular blocky; firm; common very fine roots; common very fine vesicular pores; common distinct black (10YR 2/1) organic stains on vertical faces of peds; common medium faint dark grayish brown (2.5Y 4/2) redoximorphic depletions; neutral; gradual smooth boundary.

BCg—72 to 80 inches; dark gray (10YR 4/1) silty clay; moderate coarse prismatic structure; firm; common very fine vesicular pores; common distinct very dark gray (10YR 3/1) organic stains on vertical faces of peds; common fine faint dark grayish brown (2.5Y 4/2) redoximorphic depletions; neutral.

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 or N; 10YR in overwash phase
Value—2 or 3; 2 or 3 in overwash phase
Chroma—0 or 1; 1 or 2 in overwash phase
Texture—silty clay loam or silty clay; silt loam in overwash phase
Reaction—moderately acid to slightly alkaline; moderately acid to slightly alkaline in overwash phase

Bg horizon:
Hue—10YR to 5Y

Value—2 to 5
Chroma—1
Texture—silty clay loam or silty clay
Reaction—slightly acid or neutral

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

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 through the weathering of rock and slowly transform it into a natural body consisting of genetically related horizons. The effects of climate and plant and animal life are also conditioned by relief. The parent material has a strong influence on the kind of soil profile that will be formed and in extreme cases determines it almost entirely. Finally, time is needed for the transformation of parent material into soil. The length of time may be short or long, but some time is required for the differentiation of soil horizons. A long period of time is generally required for the development of distinct horizons.

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

Climate

The climate of Adams County is continental. It is subhumid and has a wide range in temperature. The soils in the county are thought to have developed for the last 5,000 years under the kind of climate existing today. The climate from about 5,000 to 16,000 years ago, however, is thought to have been cooler and more moist (Ruhe and Scholtes, 1956).

Nearly uniform climate prevails throughout Adams County. Major differences among the soils in the county were not caused by differences in the recent climate. Soils that formed in arid and semiarid climates normally have horizons that are less developed than those in the soils in Adams County. In warm, humid areas, such as the southeastern part of the United States, soils are more highly leached and are more strongly developed than the soils in Adams County.

Living Organisms

Vegetation and micro-organisms greatly influenced the development of soils in Adams County. The micro-organisms fostered the decay of organic material. The native vegetation at the time the county was settled was mainly big bluestem and little bluestem, but a few areas along the major streams supported trees. For the last 5,000 years, the environment in Iowa was conducive to prairie vegetation (Ruhe and Scholtes, 1956). From 5,000 to 16,000 years ago, however, a cooler, wetter climate existed that was more favorable to forest. The effect of this earlier period of forest vegetation is not reflected in the morphology of some soils that have formed more recently under prairie vegetation.

Sharpsburg soils are typical of soils that formed under prairie vegetation in Adams County. The prairie grasses have thick, fibrous roots that penetrate the soil to a depth of 12 to 24 inches. As a result of this vegetation, the Sharpsburg soils have developed a thick, dark A horizon that has a relatively high content of organic matter. In contrast, the Ladoga soils that formed under mixed forest and prairie vegetation normally have an A horizon that is thinner and lighter colored. The Ladoga soils have properties intermediate between those of soils that formed entirely under prairie vegetation and those of soils that formed entirely under forest. It is believed that the Ladoga soils first formed under prairie vegetation but later were covered by trees.

The Sharpsburg and Ladoga soils are members of a partial biosequence, or a group of soils that formed in the same parent material under comparable environmental conditions, except for the native vegetation. The native vegetation has caused the main differences in morphology among the soils in the group. The biosequential relations of somewhat similar soils have been studied in some detail (White and Riecken, 1955).

Topography

Topography is an important factor in soil formation because of its effect on drainage, runoff, depth to the water table, and erosion. Slope ranges from nearly level to very steep in Adams County. A difference in relief is the main reason for the differing properties among some of the soils in the county.

Slope affects the thickness and color of the A horizon and the thickness of the solum through its effect on erosion and the amount of water that runs off and percolates through the soil. For example, the thickness and color of the A horizon in Sharpsburg and Macksburg soils, which formed in similar parent material, are related to slope. The thickness of the A horizon increases and the color darkens as the slope decreases. Sharpsburg soils are gently sloping to strongly sloping, and Macksburg soils are very gently sloping. Generally, Shelby soils are moderately sloping to steep. The solum of the Shelby soils is thinner than that of the Sharpsburg and Macksburg soils and has carbonates closer to the surface.

Relief affects the color of the B horizon through its effect on drainage and soil aeration. In well drained soils the iron in the subsoil generally is brown because iron compounds are well distributed and are oxidized. In poorly drained soils, however, the subsoil is generally grayish and mottled. The poorly drained Winterset soils, which are in level or nearly level areas, are examples. The moderately well drained, gently sloping to strongly sloping Sharpsburg soils have a brownish B horizon. Macksburg soils have profile characteristics of somewhat poorly drained soils, including a grayish brown subsoil.

Water that percolates through the solum removes clay from the A horizon, and this clay accumulates in the B horizon. Generally, more water percolates through nearly level or depressional soils than through the soils in the more sloping areas, where some of the water runs off the surface. As a result, the content of clay in the B horizon generally is higher in the nearly level areas.

Parent Material

Most of the soils in Adams County formed in materials transported to the site by glacial ice, wind, water, or gravity. These materials include loess, till, eolian sand, and alluvium. A few soils developed in exposures of the underlying bedrock, mainly shale.

The survey area underwent at least seven major episodes (“stages”) of glaciation during the Pleistocene Epoch. These stages are represented by separate till layers resting on Pennsylvanian and Cretaceous bedrock (Boellstorff, 1978). These tills are collectively referred to as Pre-Illinoian in age because they pre-date the Illinoian Glacial Stage. The youngest of the Pre-Illinoian tills is at least 500,000 years old, and the oldest is more than 2.2 million years old (Boellstorff, 1978). The glacial landscape underwent erosion, dissection, and soil formation throughout the Yarmouth Interglacial Stage, the Illinoian Glacial Stage, and the Sangamon Interglacial Stage. During the last ice age, called the Wisconsin Glacial Stage, the landscape was blanketed by windblown loess—silty deposits belonging mainly to the Peoria Formation—and less extensive deposits of eolian, or windblown, sand. (Glacial ice did not cover Adams County during either the Illinoian or the Wisconsin Stage.) During the Holocene Epoch, the landscape has become further dissected and beveled and loess-derived alluvium of the DeForest Formation has been deposited in the valleys (Bettis and others, 2002).

Loess is the most extensive parent material in the county, covering about 33 percent of the land surface. It ranges in depth from about 12 to 16 feet on the more stable summits to a thin mantle of 4 to 8 feet on the side slopes. Unweathered loess is silt loam or silty clay loam and consists of accumulated particles of silt and lesser amounts of clay deposited by the wind. The mineral composition is heterogeneous (Kay and Graham, 1943), and mineral plant nutrients are abundant. It is assumed that the loess was calcareous when it was deposited. Clearfield, Ladoga, Macksburg, Nira, Sharpsburg, and Winterset soils formed in loess. These soils can be distinguished from many other soils by the absence of pebbles and sand-sized particles in the soil profile. They can be distinguished from one another by comparing characteristics that are the result of soil-forming factors other than parent material. The characteristics of the Sharpsburg and Winterset soils in southwestern Iowa have been studied in detail (Hutton, 1947; Hutton, 1951; Ulrich, 1950; Ulrich, 1951).

Loess-covered stream terraces are adjacent to large watercourses, such as the East and Middle Nodaway Rivers, throughout Adams County. Generally, the depth of the loess on these loess-covered stream terraces is 12 to 16 feet. The content of sand in the loess on these stream terraces is somewhat higher than that in the loess on uplands. About 4 to 8 percent sand is the normal range.

Below the loess, older alluvial material exists. This older alluvium is quite variable in color and texture and was deposited during a period when the flood plain was at a much higher elevation than it is now. The buried alluvium ranges from black silly clay to stratified reddish brown sandy loam and strong brown loamy sand. Resumed downcutting of the stream channel resulted in destruction of the previous flood plain, and remnants of the older alluvium stayed at the higher elevations. These remnants of older alluvium were later buried by Wisconsin-age loess. Elevation on the loess-covered stream terraces ranges from 1,105 to 1,210 feet.

Till is another extensive parent material in Adams County. The tills are primarily subglacial in origin, consisting of unsorted deposits ranging in size from boulders to clay that were deposited beneath an ice sheet. However, the till layers also commonly contain water-sorted glacial sediments in the form of sand or silt layers and inclusions, which were deposited on top of, within, or beneath an ice sheet. The various till layers have many properties in common. In the unweathered state, the till material is a firm, calcareous clay loam containing boulders, cobbles, pebbles, sand, silt, and clay. It is a heterogeneous mixture showing little evidence of sorting or stratification. The mineral composition of the till is also very heterogeneous (Boellstorff, 1978) and includes a wide variety of rock and mineral types plucked from geologic materials overridden by the glaciers as they advanced from the north and northwest.

The soil that formed in till on level topographic divides prior to the deposition of loess is called the Yarmouth-Sangamon paleosol. This paleosol is strongly weathered as a result of long exposure on the landscape. Very few primary minerals other than quartz remain in this soil because they have been lost to weathering. The subsoil is a gray clay, often called “gumbotil” (Kay and Graham, 1943; Wood, 1941). The thickness of the gumbotil ranges from 6 feet to as much as 23 feet in southeastern Adams County.

Soils that formed on the sloping parts of the Pre-Illinoian till plain during the Sangamon Interglacial Stage, called Sangamon paleosols, are less weathered, are brownish gray or reddish in color, and are not as well developed as the Yarmouth-Sangamon paleosol. Most of these paleosols contain a layer of pebbles, or a stone line (Ruhe, 1959), in the upper part of the solum. This layer is a lag of coarse rock fragments remaining after the erosion or truncation of the surface horizons left only the lower part of the paleosol.

Deposition of several feet of loess during the Wisconsin Stage terminated soil formation on the till surface. In some cases, the buried soils were resaturated by bases leaching downward from the overlying loess. Since the Wisconsin age, most or all of the loess has been eroded away on many side slopes and the old paleosols have been re-exposed, or “exhumed.” Clarinda and Rinda soils occur in sloping areas where the Yarmouth-Sangamon paleosol has been exposed. Adair, Armstrong, Bucknell, and Lamoni soils formed in exhumed Sangamon paleosols and are typically downslope from Clarinda soils, occurring in bands at the shoulders of side slopes.

In many places, geologic erosion of the land surface was deep enough to remove the entire Yarmouth-Sangamon paleosol profile as well as the younger loess cover. In these areas, slightly weathered till is exposed at the surface. Gara and Shelby soils formed in this material.

During the formation of the Nodaway River system, extensive downcutting produced a lower landscape than elsewhere in the county and exposed several of the older Pre-Illinoian tills and their associated paleosols. Four different exhumed gray paleosols occur on steep side slopes at elevations between 1,150 and 1,240 feet; these elevations are below that of the Yarmouth-Sangamon paleosol in the county (fig. 10). These strongly weathered, gray, clayey paleosols represent successive interglacial stages during the Pre-Illinoian time period. Previously, these paleosols were not differentiated but were all referred to as Aftonian paleosols, a term that was part of an earlier simplified model of glaciation in the midcontinental United States. The paleosols are very similar in texture and morphology to the exhumed Yarmouth-Sangamon paleosol. Modern soils that formed in these older exhumed paleosols are therefore classified as Clarinda and Rinda soils like their counterparts at higher elevations. Likewise, soils that formed in the older Pre-Illinoian till layers are classified as Gara and Shelby soils.

This landscape within the Nodaway River valley is characterized by a distinct absence of truncated Sangamon paleosols and an increased occurrence of older, gray, exhumed Pre-Illinoian paleosols. These characteristics are due to the continued geologic downcutting that continued through Sangamon time, which resulted in less intense weathering of the paleosols. The Sangamon paleosols in Adams County are more abundant in Lincoln, Carl, Colony, and Union Townships, where the truncated Yarmouth-Sangamon paleosol is still present, at elevations above 1,250 feet.

Alluvium is the third most extensive parent material in Adams County. The texture of the alluvium normally ranges from silt loam to silty clay. Some of the alluvial

Figure 10.—Multiple pre-Illinoian tills and paleosols are evident throughout the Nodaway River valley. In this photograph, note the younger till on top of the older gray paleosol.

material was transported only short distances and is called local alluvium. This local alluvium retains many characteristics of the soils in the area from which it was eroded. Judson soils, for example, which generally occur at the foot of slopes directly below loess-derived soils, have less sand and more silt in the solum than other soils. Olmitz soils are downslope from till-derived soils and contain correspondingly more sand in the solum. Kennebec, Nodaway, Wabash, and Zook soils formed in alluvium consisting of local sediments that washed from nearby uplands and intermixed with sediments that washed from longer distances. Bremer, Nevin, and Wiota soils are above the level of the present flood plain and presumably formed in older alluvium than that in which the Kennebec and Wabash soils formed. The Nodaway soils formed in deposited alluvium.

Eolian sand is much less extensive in Adams County than the other major parent materials. It consists largely of quartz sand, which is very resistant to weathering. Soils that formed in eolian sand, such as Dickman soils that have a loamy substratum, exhibit minimal soil development. These soils can be distinguished from other soils by their high sand content and low clay content.

A few exposures of shale occur in Adams County, mainly in the western half of the county. Weathered shale can be distinguished from loess by its high clay content and by its slippery feel when moist. Unlike till, weathered shale does not contain coarse sand and gravel. The Pennsylvanian shale in Adams County contains numerous shells from aquatic invertebrates, which make the bedrock high in calcium carbonate. In contrast, the younger Cretaceous shales in the northwestern part of the county are acidic.

Time

Time is required for the various processes of soil formation to affect the parent material of soils. The amount of time necessary ranges from a few days for the formation of fresh alluvial deposits, such as those that make up Nodaway soils, to more than a thousand years for many of the older upland soils. Older or more strongly developed soils have well defined genetic horizons and have a higher content of clay in the subsoil than younger soils that formed in similar kinds of parent material. As a soil forms, clay is moved from the surface layer to the subsoil. This transfer increases the content of clay in the subsoil. The increased content of clay in the subsoil is more evident in a nearly level soil than in a more sloping soil. Ladoga and Sharpsburg soils are examples of soils in which this process has taken place. A less well developed soil has only weakly developed horizons. Some of the soils that formed in alluvium have little or no profile development because fresh material is deposited periodically.

If other factors are favorable, the texture of the subsoil generally becomes finer and a greater amount of soluble materials are leached out as the soils continue to weather. On the steeper soils, material is generally removed before there has been time for the development of a deep profile that has strongly defined horizons. Even where the material has been in place a long time, the soil exhibits little development because much of the water runs off the surface instead of through the soil material. Gara and Shelby soils formed on recently dissected slopes of Late Wisconsin age.

In places where organic materials, such as trees, have been buried by later deposition through the action of ice, water, or wind, the age of the landscape can be determined by the process known as radio carbon dating. In Adams County, the loess in which Sharpsburg and Ladoga soils formed, called Peorian Loess, is about 12,500 to 25,000 years old (U.S. Geological Survey, 1996). Time is needed for soil development, but the age of the parent material does not necessarily reflect the true age of the soil profile that formed in that material.

Processes of Horizon Differentiation

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

The accumulation of organic material is an early phase in the formation of most soils. The content of organic matter ranges from high to very low in the A horizon of the soils in Adams County. It is low in the thin A horizon of the Ladoga soils and high in the thick A horizon of the Winterset and Zook soils.

The removal and transfer of chemical compounds within the soil profile are important aspects in horizon development of the soils in Adams County. Free carbonates and bases have been leached downward from horizons above. Some soils are so strongly leached that they are strongly acid in the subsoil. Phosphorus is removed from the subsoil by plant roots and transferred to the parts of the plant growing above the ground. It is then returned to the surface layer in the plant residue. This process affects the forms and distribution of the phosphorus in the profile.

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

Shrinking and swelling can result in another kind of transfer. This process has a minimal effect in most soils but occurs to a greater extent in very clayey soils. Shrinking occurs as the soil dries, causing cracks to form, which results in the incorporation of soil materials from the surface layer into lower parts of the soil profile.

Transformations are physical and chemical. For example, in a common physical transformation, soil particles are weathered to smaller sizes. The reduction of iron is an example of a chemical transformation. This process, which is called gleying, involves the saturation of the soil with water for long periods in the presence of organic matter. It is characterized by the presence of ferrous iron and gray colors. Gleying is associated with poorly drained soils, such as Winterset soils. The content of reductive extractable iron, or free iron, is normally lower in somewhat poorly drained soils, such as Nevin soils, than in more well drained soils.

The weathering of the primary apatite mineral present in parent material to secondary phosphorus compounds is another kind of transformation. At pH level near 7, for example, the primary mineral apatite is weathered to secondary phosphorus compounds. Thus, soils that have a pH near 7, such as Sharpsburg soils, have more available phosphorus than calcareous soils that have a pH of more than 7.3.

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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. 11). In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Basal till. Compact till deposited beneath the ice.

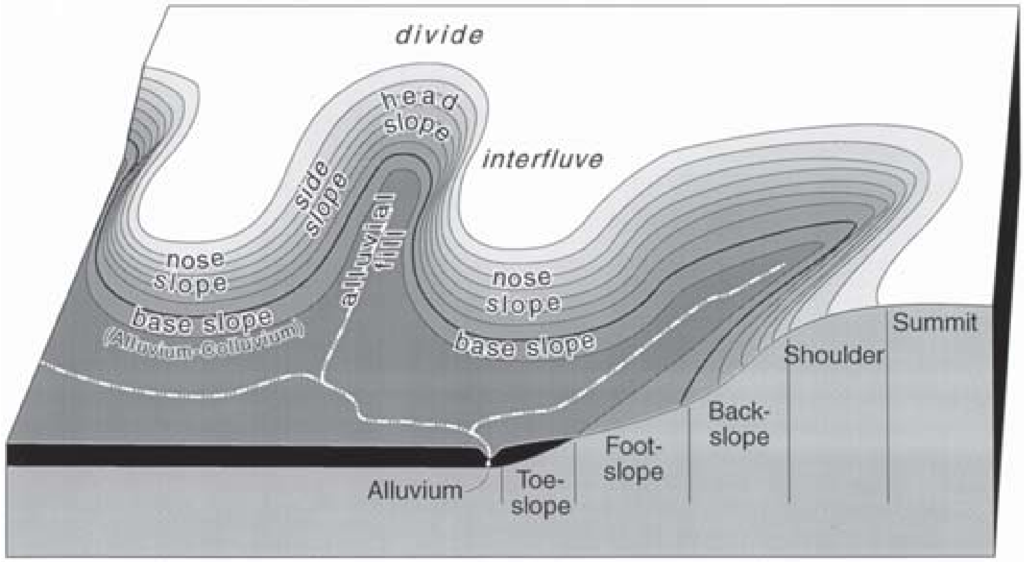

Figure 11.—Landscape relationship of geomorphic components and hillslope positions (modified after Ruhe and Walker, 1968).

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. 11) 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. 11); 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. 11). 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. 11). 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. 11).

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. 11); 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. 11). 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, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock 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. 11). 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. 11). 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. 11). 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. 11). 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.

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