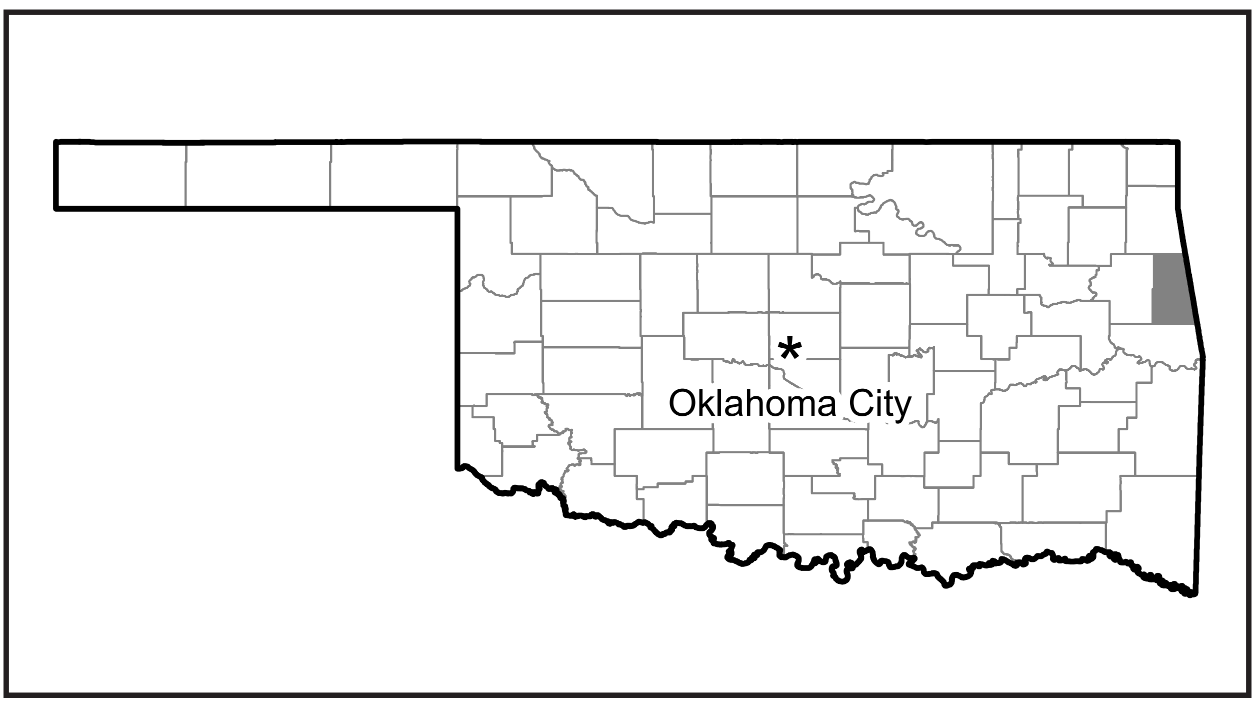
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

In cooperation with the Oklahoma Agricultural Experiment Station and the Oklahoma Conservation Committee

Supplement to the Soil Survey of Adair County, Oklahoma



How To Use This Soil Survey Supplement

This document, in conjunction with the Web Soil Survey, supplements the Soil Survey of Adair County, Oklahoma, published in 1965. Find a map of your area of interest on the Web Soil Survey at http://websoilsurvey.nrcs.usda.gov. Note the map unit symbols in the area. Turn to the **Contents** in this supplement. The **Contents** lists the map units by symbol and name and shows the page where each map unit is described. Also see the **Contents** for sections of this publication that may address your specific needs.

Advancements in technology and increases in the intensity and variety of land uses have produced a need for updated soils information. In preparation for this publication, the correlation for the Soil Survey of Adair County was amended in June 1996, November 2001, and December 2002. This publication and the Web Soil Survey include the recorrelated map unit legend and updated information regarding major soil properties and the use and management of the soils. In some cases, the name of the map unit and the name of the soil series have changed from the first publication. The map unit symbols and map delineations have not changed.

Web Soil Survey

The latest detailed soil maps and updated tabular data, including soil properties and interpretations, are available on the Web Soil Survey at http://websoilsurvey.nrcs.usda.gov.

Archived Soil Survey

Comprehensive descriptions of the detailed soil map units and additional information about the soils in the survey area are archived in the original Soil Survey of Adair County, Oklahoma. Archived soil surveys are available from many libraries, from the local office of the Natural Resources Conservation Service, and from the Adair County Conservation District in Stilwell, Oklahoma.

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

Major fieldwork for the Soil Survey of Adair County, Oklahoma, was completed in 1961. Soil names and descriptions were approved in 1963 and were revised in 1997. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1997. The maps for the survey were recompiled utilizing survey imagery at 1:24,000 and rectified to 1995 digital orthophotography for SSURGO digitizing. The survey was made cooperatively by the Natural Resources Conservation Service, the Oklahoma Agricultural Experiment Station, and the Oklahoma Conservation Commission. It is part of the technical assistance furnished to the Adair County Conservation District.

Contents

Issued January 2007

Foreword

This soil survey supplement contains information that can be used in conjunction with the previously published soil survey and with online resources. It provides valuable information for land-planning programs in Oklahoma. It contains predictions of soil behavior for selected land uses. This supplement also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

Soil surveys are designed for many different users. Farmers, ranchers, foresters, and agronomists can use a survey 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 a survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use a survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are not suited for use as septic tank absorption fields. A high water table makes a soil very limited for basements or underground installations.

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

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Supplement to the Soil Survey of Adair County, Oklahoma

Fieldwork by Peter Warth and Dock J. Polone,
Natural Resources Conservation Service

United States Department of Agriculture,
Natural Resources Conservation Service,
in cooperation with
the Oklahoma Agricultural Experiment Station and
the Oklahoma Conservation Commission

This supplement provides information to update the original Soil Survey of Adair County, Oklahoma, which was issued September 1965 (USDA, 1965). The original tables and maps are not included in this document. Updated tables and new digital maps on updated photography are available from the Web Soil Survey at http://websoilsurvey.nrcs.usda.gov. The tables were generated from the NRCS National Soil Information System (NASIS) and are also available from the NRCS Soil Data Mart at http://soildatamart.nrcs.usda.gov.

Adair County is in the mountainous east-central part of Oklahoma (fig. 1). Adjacent counties in Oklahoma are Delaware County on the north, Cherokee County on the west, and Sequoyah County on the south. Adair County is bordered on the east by the State of Arkansas and has an area of 577 square miles, or 369,062 acres. Stilwell, the county seat, is in the east-central part of the county, 7 miles west of the Arkansas State line.

Agriculture and related services are important in Adair County. The chief sources of income are the sale of poultry, livestock, and related products. Strawberries and peaches are important horticultural products produced in the area. Corn, small grains, grain sorghum, and improved grasses and legumes for hay are grown mostly as feed

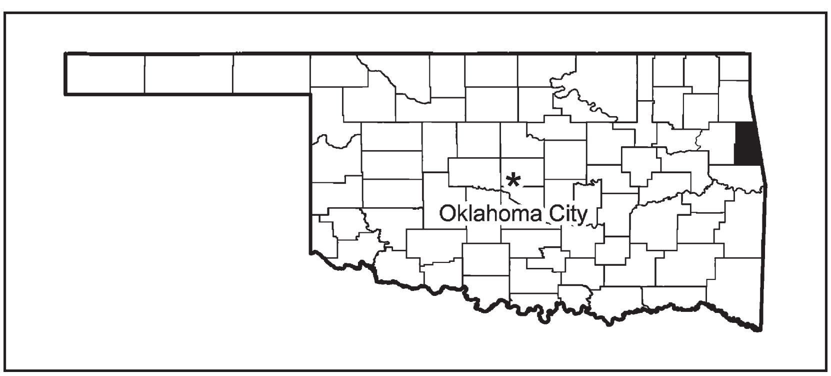

Figure 1.—Location of Adair County in Oklahoma.

for the poultry and livestock industries. About two-thirds of the total acreage is woodland.

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observe 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 dig many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in a 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 a 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 record the characteristics of the soil profiles that they study. They note color, texture, size, and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in a survey area and determining their properties, the soil scientists assign 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 classify and name the soils in a survey area, they compare the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

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

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

After soil scientists locate and identify the significant natural bodies of soil in a survey area, they draw 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 a survey area do not always fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

General Nature of the Survey Area

This section provides information that may be useful to persons not familiar with Adair County. This section briefly describes subjects of general interest, including relief, drainage, and climate.

The first settlers in the region were Cherokee Indians, who arrived shortly after 1800. They found thick forests of pine and oak and a few grassy savannahs and prairie-like openings, which were in the broad, sloping valleys in the northern and central portions of the county. The Cherokees tried many crops that they had grown in their previous southern homelands. Peaches and tobacco were planted, but the principal crops were corn and wheat. Cultivated areas were small and fenced to keep out free-range livestock.

The first water-powered gristmill was constructed near Bitting Springs in 1844.

In 1907, when Indian Territory was admitted to the Union of the United States as the State of Oklahoma, the area became Adair County. The county was named in honor of a prominent Cherokee jurist and educator.

The county is served by the Kansas City Southern railroad and by an airport facility at Stilwell. It is also served by two Federal highways, three State highways, and numerous county roads. Some of the county roads have been surfaced and are suitable for all-weather travel.

Relief and Drainage

In most of Adair County, the soils are moderately sloping to very steep. They range from shallow to very deep. Most parts of the county are drained by the Illinois River and its tributaries, which include Ballard Creek, Baron Fork Creek, and Caney Creek. Some areas in the southern part of the county drain southward to the Arkansas River.

Climate

The Natural Resources Conservation Service National Water and Climate Center, Portland, Oregon, helped prepare this section.

The climate tables were created using data from the climate station at Stilwell, Oklahoma. Thunderstorm days, relative humidity, percent sunshine, and wind information were estimated using data from the first order station at Fort Smith, Arkansas.

The table “Temperature and Precipitation” gives data for the survey area as recorded at Stilwell in the period 1960 to 2005. The table “Freeze Dates in Spring and Fall” shows probable dates of the first freeze in fall and the last freeze in spring. The table “Growing Season” provides data on the length of the growing season.

In winter, the average temperature is 39.7 degrees F and the average daily minimum temperature is 29.2 degrees. The lowest temperature on record, which occurred at Stilwell on December 23, 1989, is 12 degrees. In summer, the average temperature is 77.6 degrees and the average daily maximum temperature is 88.7 degrees. The highest temperature, which occurred at Stilwell on July 29, 1986, is 108 degrees.

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

The average annual total precipitation is about 49.86 inches. Of this, about 31.55 inches, or 63 percent, usually falls in April through October. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 6.45 inches at Stilwell on September 27, 1996. Thunderstorms occur on about 57 days each year. Most occur in May, which averages 8.5.

The average seasonal snowfall is 12.0 inches. The greatest snow depth at any one time during the period of record was 14 inches recorded on March 6, 1989. On an average, 12 days per year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 12.1 inches recorded on March 6, 1989.

The average relative humidity in mid-afternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 72 percent of the time possible in summer and 52 percent in winter. The prevailing wind is from the northeast. Average wind speed is highest, 9.4 miles per hour, in March.

Table 1.--Temperature and Precipitation

[Recorded in the period 1971-2000 at Stilwell, Oklahoma]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Max. temp. higher than	2 years in 10 will have-- Min. temp. lower than	Average number of growing degree days*	Avg.	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch	Average snowfall
	°F	*°F*	*°F*	*°F*	*°F*	*Units*	*In*	*In*	*In*		*In*
January----	47.2	26.5	36.9	72	-2	16	2.46	0.82	3.92	4	4.4
February---	53.4	31.3	42.4	77	1	45	2.77	1.23	4.19	4	3.2
March------	62.2	39.4	50.8	83	13	137	4.52	2.49	6.50	6	1.5
April------	71.0	47.4	59.2	86	26	295	4.76	2.59	6.93	7	0.0
May--------	77.6	56.1	66.9	89	36	517	5.99	3.54	8.42	7	0.0
June-------	85.0	64.1	74.5	94	46	736	5.16	2.32	7.81	7	0.0
July-------	90.8	68.4	79.6	103	53	916	3.21	0.80	5.22	4	0.0
August-----	90.2	66.9	78.6	101	51	886	3.46	1.39	5.41	4	0.0
September--	82.5	60.4	71.5	98	36	645	4.74	2.58	6.65	6	0.0
October----	72.7	49.6	61.2	88	27	358	4.23	1.89	6.46	5	0.0
November---	59.8	39.3	49.5	79	15	116	4.91	2.57	7.16	6	1.1
December---	49.8	29.9	39.9	73	3	29	3.65	1.58	5.52	5	1.8
Yearly:											
Average--	70.2	48.3	59.2	---	---	---	---	---	---	---	---
Extreme--	108	-12	---	104	-6	---	---	---	---	---	---
Total----	---	---	---	---	---	4,695	49.86	39.25	57.91	65	12.0

* 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 Stilwell, Oklahoma]

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--	Mar. 31	Apr. 12	Apr. 22
2 years in 10 later than--	Mar. 25	Apr. 7	Apr. 18
5 years in 10 later than--	Mar. 14	Mar. 28	Apr. 11
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 26	Oct. 22	Oct. 4
2 years in 10 earlier than--	Nov. 2	Oct. 28	Oct. 10
5 years in 10 earlier than--	Nov. 14	Nov. 8	Oct. 22

Table 3.--Growing Season

[Recorded in the period 1971-2000 at Stilwell, Oklahoma]

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	214	203	172
8 years in 10	224	210	180
5 years in 10	244	224	194
2 years in 10	263	237	208
1 year in 10	273	244	215

Detailed Soil Map Units

Detailed soil maps for the survey area are available online at http://websoilsurvey.nrcs.usda.gov. The map units on the detailed soil maps represent the soils and 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 the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, are mapped without areas of minor components of other taxonomic classes. Consequently, map units are made up of the soils or miscellaneous areas for which they are named and some areas of included soils that belong to other taxonomic classes.

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

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

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit.

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

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Mason silt loam, 0 to 1 percent slopes, rarely flooded, is a phase of the Mason series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

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. Hector-Linker complex, 1 to 5 percent slopes, is an example.

This survey includes miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Pits is an example.

The table "Acreage and Proportionate Extent of the Soils" gives the acreage and proportionate extent of each map unit. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
BdD	Clarksville very gravelly silt loam, 1 to 8 percent slopes	55,702	15.1
BoE	Clarksville stony silt loam, 5 to 15 percent slopes	16,318	4.4
BsF	Clarksville stony silt loam, 20 to 50 percent slopes	89,588	24.3
CrC	Craig gravelly silt loam, 1 to 5 percent slopes	1,278	0.3
DAM	Large dam	78	*
DcB	Captina silt loam, 1 to 3 percent slopes	13,449	3.6
DkA	Tonti gravelly silt loam, 0 to 3 percent slopes	22,083	6.0
EaA	Britwater silt loam, 0 to 1 percent slopes	1,636	0.4
EaB	Britwater silt loam, 1 to 3 percent slopes	7,207	2.0
EoB	Waben gravelly silt loam, 1 to 3 percent slopes	11,449	3.1
EtD	Waben gravelly silt loam, 3 to 8 percent slopes	18,631	5.0
Ga	Elsah gravelly silt loam, 0 to 1 percent slopes, frequently flooded	12,253	3.3
Hc	Hector-Linker complex, 5 to 45 percent slopes	81,010	22.0
HlC	Hector-Linker complex, 1 to 5 percent slopes	12,560	3.4
Hn	Razort silt loam, 0 to 1 percent slopes, occasionally flooded	2,119	0.6
Hu	Elsah gravelly loam, 0 to 1 percent slopes, occasionally flooded	3,407	0.9
JaA	Jay silt loam, 0 to 2 percent slopes	3,990	1.1
La	Captina silt loam, 0 to 1 percent slopes	580	0.2
LkC	Linker fine sandy loam, 1 to 5 percent slopes	2,750	0.7
LkC2	Linker fine sandy loam, 3 to 5 percent slopes, eroded	589	0.2
LnC	Linker loam, 3 to 5 percent slopes	1,504	0.4
LnC2	Linker loam, 3 to 5 percent slopes, eroded	578	0.2
M-W	Miscellaneous water	34	*
MasA	Mason silt loam, 0 to 1 percent slopes, rarely flooded	37	*
Oc	Osage clay, 0 to 1 percent slopes, occasionally flooded	463	0.1
PaA	Parsons silt loam, 0 to 1 percent slopes	680	0.2
PIT	Pits	166	*
So	Sogn silty clay loam, 1 to 12 percent slopes	1,904	0.5
SuA	Apperson silty clay loam, 0 to 1 percent slopes	843	0.2
SuB	Apperson silty clay loam, 1 to 3 percent slopes	1,528	0.4
SuC	Apperson silty clay loam, 3 to 5 percent slopes	557	0.2
SuC2	Apperson silty clay loam, 3 to 5 percent slopes, eroded	271	*
Ta	Stigler silt loam, 0 to 1 percent slopes	2,071	0.6
TkA	Taloka silt loam, 0 to 1 percent slopes	256	*
W	Water	1,493	0.4
	Total	369,062	100.0

* Less than 0.1 percent.

BdD—Clarksville very gravelly silt loam, 1 to 8 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 700 to 1,400 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 200 days

Major Component Description

Clarksville
Extent: 95 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes
Parent material: Loamy colluvium over residuum weathered from cherty limestone
Slope: 1 to 8 percent
Runoff: Low
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid
Slowest permeability class within a depth of 80 inches: Moderate
Drainage class: Somewhat excessively drained
Available water capacity: About 4.6 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 4e
Typical profile:
A—0 to 12 inches; very gravelly silt loam
BE—12 to 20 inches; very gravelly silty clay loam
Bt—20 to 60 inches; very gravelly silty clay

Additional Components

Tonti soils: 5 percent of the map unit

BoE—Clarksville stony silt loam, 5 to 15 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 700 to 1,200 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 200 days

Major Component Description

Clarksville
Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes
Parent material: Loamy colluvium over residuum weathered from cherty limestone
Slope: 5 to 15 percent
Runoff: Low
Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid
Slowest permeability class within a depth of 80 inches: Moderate
Drainage class: Somewhat excessively drained
Available water capacity: About 4.6 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 6e
Typical profile:
A—0 to 14 inches; stony silt loam
BE—14 to 20 inches; very gravelly silty clay loam
Bt—20 to 61 inches; very gravelly silty clay

BsF—Clarksville stony silt loam, 20 to 50 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 700 to 1,200 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 200 days

Major Component Description

Clarksville
Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes
Parent material: Loamy colluvium over residuum weathered from cherty limestone
Slope: 20 to 50 percent
Runoff: Medium
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid
Slowest permeability class within a depth of 80 inches: Moderate
Drainage class: Somewhat excessively drained
Available water capacity: About 4.6 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 8e
Typical profile:
A—0 to 14 inches; stony silt loam
BE—14 to 20 inches; very gravelly silty clay loam
Bt—20 to 61 inches; very gravelly silty clay

CrC—Craig gravelly silt loam, 1 to 5 percent slopes

Map Unit Setting

Major land resource area: 112
Elevation: 800 to 1,000 feet
Mean annual precipitation: 37 to 47 inches
Mean annual air temperature: 57 to 62 degrees F
Frost-free period: 200 to 220 days

Major Component Description

Craig
Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes
Parent material: Clayey residuum weathered from cherty limestone
Slope: 1 to 5 percent
Runoff: Medium
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow
Slowest permeability class within a depth of 80 inches: Moderately slow
Drainage class: Well drained
Available water capacity: About 4.4 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 3e
Ecological site number and name: R112XY059OK, Loamy Prairie (Northeast) PE 62-80
Typical profile:
A—0 to 11 inches; gravelly silt loam
Bt—11 to 26 inches; very gravelly silty clay loam
BC—26 to 60 inches; very gravelly clay

DAM—Large dam

Map Unit Setting

Major land resource area: 116A
Elevation: 700 to 2,000 feet
Mean annual precipitation: 30 to 35 inches
Mean annual air temperature: 60 to 61 degrees F
Frost-free period: 200 to 210 days

Major Component Description

Large dam
Extent: 100 percent of the map unit
Definition: This map unit consists of dams constructed to impound water for ponds and lakes.
Geomorphic setting: Artificial levees
Parent material: Mine spoil or earthy fill
Slope: 3 to 45 percent
Runoff: Very high
Land capability classification, nonirrigated: 8

DcB—Captina silt loam, 1 to 3 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 700 to 1,400 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 200 days

Major Component Description

Captina
Extent: 95 percent of the map unit
Geomorphic setting: Paleoterraces on uplands
Position on the landform: Treads
Parent material: Loess over colluvium and/or residuum weathered from cherty limestone
Slope: 1 to 3 percent
Runoff: Very high
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Slow
Slowest permeability class within a depth of 80 inches: Slow
Drainage class: Moderately well drained
Available water capacity: About 7.6 inches
Depth to the top of the seasonal high water table: 1.0 to 2.0 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 3e
Ecological site number and name: R116AY092OK, Smooth Chert Savannah PE 72-80
Typical profile:
A—0 to 10 inches; silt loam
Bt—10 to 26 inches; silty clay loam
2Btx1—26 to 34 inches; gravelly silty clay loam
2Btx2—34 to 44 inches; very gravelly silty clay loam
3Bt—44 to 60 inches; very gravelly silty clay loam

Additional Components

Clarksville soils: 3 percent of the map unit
Tonti soils: 2 percent of the map unit

DkA—Tonti gravelly silt loam, 0 to 3 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 900 to 1,400 feet
Mean annual precipitation: 42 to 46 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 200 days

Major Component Description

Tonti
Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Shoulders
Parent material: Loamy residuum weathered from cherty limestone
Slope: 0 to 3 percent
Runoff: Very high
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Slow
Slowest permeability class within a depth of 80 inches: Slow
Drainage class: Moderately well drained
Available water capacity: About 6.6 inches

Depth to the top of the seasonal high water table: 1.5 to 2.5 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 3s
Typical profile:
A—0 to 10 inches; gravelly silt loam
Bt—10 to 26 inches; gravelly silty clay loam
Btx—26 to 34 inches; very gravelly silt loam
BC—34 to 61 inches; very gravelly silty clay

EaA—Britwater silt loam, 0 to 1 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 1,000 to 1,400 feet
Mean annual precipitation: 38 to 48 inches
Mean annual air temperature: 54 to 58 degrees F
Frost-free period: 160 to 195 days

Major Component Description

Britwater
Extent: 100 percent of the map unit
Geomorphic setting: Paleoterraces on uplands
Position on the landform: Treads
Parent material: Loamy alluvium derived from cherty limestone
Slope: 0 to 1 percent
Runoff: Negligible
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Moderate
Drainage class: Well drained
Available water capacity: About 8.3 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 1
Ecological site number and name: R116AY092OK, Smooth Chert Savannah PE 72-80
Typical profile:
Ap—0 to 10 inches; silt loam
Bt1—10 to 35 inches; gravelly silty clay loam
Bt2—35 to 40 inches; very gravelly silty clay loam
C—40 to 62 inches; very gravelly silty clay

EaB—Britwater silt loam, 1 to 3 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 1,000 to 1,400 feet
Mean annual precipitation: 38 to 48 inches
Mean annual air temperature: 54 to 58 degrees F
Frost-free period: 160 to 195 days

Major Component Description

Britwater

Extent: 100 percent of the map unit
Geomorphic setting: Paleoterraces on uplands
Position on the landform: Treads
Parent material: Loamy alluvium derived from cherty limestone
Slope: 1 to 3 percent
Runoff: Low
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Moderate
Drainage class: Well drained
Available water capacity: About 8.3 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 2e
Ecological site number and name: R116AY092OK, Smooth Chert Savannah PE 72-80
Typical profile:
Ap—0 to 10 inches; silt loam
Bt1—10 to 35 inches; gravelly silty clay loam
Bt2—35 to 40 inches; very gravelly silty clay loam
C—40 to 62 inches; very gravelly silty clay

EoB—Waben gravelly silt loam, 1 to 3 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 1,000 to 1,400 feet
Mean annual precipitation: 42 to 46 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 195 days

Major Component Description

Waben

Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Shoulders
Parent material: Loamy alluvium and/or colluvium derived from cherty limestone
Slope: 1 to 3 percent
Runoff: Very low
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid
Slowest permeability class within a depth of 80 inches: Moderately rapid
Drainage class: Well drained
Available water capacity: About 6.1 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 3e

Ecological site number and name: R116AY092OK, Smooth Chert Savannah PE 72-80
Typical profile:
Ap—0 to 10 inches; gravelly silt loam
BE—10 to 17 inches; very gravelly silt loam
Bt—17 to 30 inches; very gravelly silt loam
BC—30 to 72 inches; extremely gravelly silt loam

EtD—Waben gravelly silt loam, 3 to 8 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 1,000 to 1,400 feet
Mean annual precipitation: 42 to 46 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 195 days

Major Component Description

Waben
Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes
Parent material: Loamy alluvium and/or colluvium derived from cherty limestone
Slope: 3 to 8 percent
Runoff: Low
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid
Slowest permeability class within a depth of 80 inches: Moderately rapid
Drainage class: Well drained
Available water capacity: About 6.1 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 4e
Ecological site number and name: R116AY092OK, Smooth Chert Savannah PE 72-80
Typical profile:
Ap—0 to 10 inches; gravelly silt loam
BE—10 to 17 inches; very gravelly silt loam
Bt—17 to 50 inches; extremely gravelly silty clay loam
BC—50 to 72 inches; extremely gravelly silt loam

Ga—Elsah gravelly silt loam, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

Major land resource area: 116A
Elevation: 340 to 1,500 feet
Mean annual precipitation: 36 to 48 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 180 to 200 days

Major Component Description

Elsah

Extent: 100 percent of the map unit
Geomorphic setting: Flood plains on drainageways in valleys
Parent material: Gravelly, loamy alluvium
Slope: 0 to 1 percent
Runoff: Negligible
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Moderate
Drainage class: Well drained
Available water capacity: About 7.2 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: Frequent
Ponding: None
Land capability classification, nonirrigated: 5w
Typical profile:
A—0 to 9 inches; gravelly silt loam
AB—9 to 45 inches; gravelly silt loam
Bw—45 to 65 inches; very gravelly silt loam

Hc—Hector-Linker complex, 5 to 45 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 500 to 2,800 feet
Mean annual precipitation: 43 to 50 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 175 to 210 days

Major Component Description

Hector

Extent: 80 percent of the map unit
Geomorphic setting: Mountain slopes on mountains
Position on the landform: Mountainflanks
Parent material: Loamy residuum weathered from sandstone
Slope: 5 to 45 percent
Runoff: Very high
Soil depth: 10 to 20 inches to bedrock (lithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid
Slowest permeability class within a depth of 80 inches: Impermeable
Drainage class: Well drained
Available water capacity: About 1.6 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 7e
Ecological site number and name: R116AY088OK, Shallow Savannah PE 72-80
Typical profile:
A—0 to 6 inches; stony fine sandy loam
Bw—6 to 14 inches; gravelly fine sandy loam
R—14 to 20 inches; bedrock

Linker
Extent: 20 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes
Parent material: Loamy residuum weathered from sandstone
Slope: 5 to 45 percent
Runoff: High
Soil depth: 20 to 40 inches to bedrock (lithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Impermeable
Drainage class: Well drained
Available water capacity: About 4.2 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 7e
Ecological site number and name: R116AY075OK, Sandy Savannah PE 72-80
Typical profile:
Ap—0 to 6 inches; stony fine sandy loam
BA—6 to 10 inches; gravelly loam
Bt—10 to 30 inches; gravelly loam
BC—30 to 34 inches; gravelly sandy clay loam
R—34 to 40 inches; bedrock

HlC—Hector-Linker complex, 1 to 5 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 500 to 2,800 feet
Mean annual precipitation: 43 to 50 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 175 to 210 days

Major Component Description

Hector
Extent: 60 percent of the map unit
Geomorphic setting: Mountain slopes on mountains
Position on the landform: Mountainflanks
Parent material: Loamy residuum weathered from sandstone
Slope: 1 to 3 percent
Runoff: Very high
Soil depth: 10 to 20 inches to bedrock (lithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid
Slowest permeability class within a depth of 80 inches: Impermeable
Drainage class: Well drained
Available water capacity: About 1.9 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 4s
Ecological site number and name: R116AY088OK, Shallow Savannah PE 72-80

Typical profile:
Ap—0 to 10 inches; fine sandy loam
Bw—10 to 16 inches; gravelly fine sandy loam
R—16 to 20 inches; bedrock

Linker
Extent: 40 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes
Parent material: Loamy residuum weathered from sandstone
Slope: 1 to 5 percent
Runoff: High
Soil depth: 20 to 40 inches to bedrock (lithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Impermeable
Drainage class: Well drained
Available water capacity: About 4.5 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 3e
Ecological site number and name: R116AY075OK, Sandy Savannah PE 72-80
Typical profile:
Ap—0 to 6 inches; fine sandy loam
BA—6 to 10 inches; gravelly loam
Bt—10 to 30 inches; loam
BC—30 to 34 inches; sandy clay loam
R—34 to 40 inches; bedrock

Hn—Razort silt loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

Major land resource area: 116A
Elevation: 500 to 1,000 feet
Mean annual precipitation: 42 to 46 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 195 days

Major Component Description

Razort
Extent: 100 percent of the map unit
Geomorphic setting: Flood plains in valleys
Parent material: Silty alluvium
Slope: 0 to 1 percent
Runoff: Negligible
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Moderate
Drainage class: Well drained
Available water capacity: About 9.0 inches
Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Occasional
Ponding: None
Land capability classification, nonirrigated: 2w
Typical profile:
A—0 to 8 inches; silt loam
AC—8 to 40 inches; gravelly loam
C—40 to 62 inches; very gravelly silt loam

Hu—Elsah gravelly loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

Major land resource area: 116A
Elevation: 340 to 1,500 feet
Mean annual precipitation: 36 to 48 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 180 to 200 days

Major Component Description

Elsah
Extent: 100 percent of the map unit
Geomorphic setting: Flood plains on drainageways in valleys
Parent material: Gravelly, loamy alluvium
Slope: 0 to 1 percent
Runoff: Negligible
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Moderate
Drainage class: Well drained
Available water capacity: About 6.5 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: Occasional
Ponding: None
Land capability classification, nonirrigated: 3s
Typical profile:
A—0 to 9 inches; gravelly loam
AC—9 to 30 inches; very gravelly loam
C—30 to 62 inches; very gravelly loam

JaA—Jay silt loam, 0 to 2 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 1,200 to 1,500 feet
Mean annual precipitation: 42 to 46 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 195 days

Major Component Description

Jay
Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Shoulders
Parent material: Loamy residuum weathered from siltstone
Slope: 0 to 2 percent
Runoff: Low
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow
Slowest permeability class within a depth of 80 inches: Slow
Drainage class: Moderately well drained
Available water capacity: About 10.6 inches
Depth to the top of the seasonal high water table: 2.0 to 3.0 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 2e
Ecological site number and name: R116AY059OK, Loamy Prairie (Northeast) PE 72-80
Typical profile:
A—0 to 24 inches; silt loam
Btx—24 to 44 inches; silty clay loam
B´x—44 to 72 inches; silt loam

La—Captina silt loam, 0 to 1 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 700 to 1,400 feet
Mean annual precipitation: 42 to 46 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 195 days

Major Component Description

Captina
Extent: 100 percent of the map unit
Geomorphic setting: Paleoterraces on uplands
Position on the landform: Treads
Parent material: Loess over colluvium and/or residuum weathered from cherty limestone
Slope: 0 to 1 percent
Runoff: Very high
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Slow
Slowest permeability class within a depth of 80 inches: Slow
Drainage class: Moderately well drained
Available water capacity: About 7.1 inches
Depth to the top of the seasonal high water table: 1.0 to 2.0 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 2w
Ecological site number and name: R116AY092OK, Smooth Chert Savannah PE 72-80
Typical profile:
A—0 to 8 inches; silt loam
BA—8 to 20 inches; silty clay loam
Bt1—20 to 32 inches; gravelly silty clay loam

Bt2—32 to 50 inches; very gravelly silty clay loam
Bt3—50 to 65 inches; gravelly silty clay

LkC—Linker fine sandy loam, 1 to 5 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 500 to 2,800 feet
Mean annual precipitation: 43 to 50 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 175 to 210 days

Major Component Description

Linker
Extent: 95 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes
Parent material: Loamy residuum weathered from sandstone
Slope: 1 to 5 percent
Runoff: High
Soil depth: 20 to 40 inches to bedrock (lithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Impermeable
Drainage class: Well drained
Available water capacity: About 4.6 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 3e
Ecological site number and name: R116AY075OK, Sandy Savannah PE 72-80
Typical profile:
A—0 to 6 inches; fine sandy loam
Bt—6 to 30 inches; loam
BC—30 to 34 inches; sandy clay loam
R—34 to 40 inches; bedrock

Additional Components

Hector soils: 5 percent of the map unit

LkC2—Linker fine sandy loam, 3 to 5 percent slopes, eroded

Map Unit Setting

Major land resource area: 116A
Elevation: 500 to 2,800 feet
Mean annual precipitation: 43 to 50 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 175 to 210 days

Major Component Description

Linker
Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes
Parent material: Loamy residuum weathered from sandstone
Slope: 3 to 5 percent
Runoff: High
Soil depth: 20 to 40 inches to bedrock (lithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Impermeable
Drainage class: Well drained
Available water capacity: About 4.6 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 4e
Ecological site number and name: R116AY875OK, Reseeded Sandy Savannah PE 72-80
Typical profile:
Ap—0 to 6 inches; fine sandy loam
Bt—6 to 30 inches; loam
BC—30 to 34 inches; sandy clay loam
R—34 to 40 inches; bedrock

LnC—Linker loam, 3 to 5 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 500 to 2,800 feet
Mean annual precipitation: 43 to 50 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 175 to 210 days

Major Component Description

Linker
Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes
Parent material: Loamy residuum weathered from sandstone
Slope: 3 to 5 percent
Runoff: High
Soil depth: 20 to 40 inches to bedrock (lithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Impermeable
Drainage class: Well drained
Available water capacity: About 4.9 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 3e
Ecological site number and name: R116AY075OK, Sandy Savannah PE 72-80
Typical profile:
Ap—0 to 6 inches; loam
Bt—6 to 30 inches; loam

BC—30 to 34 inches; sandy clay loam
R—34 to 40 inches; bedrock

LnC2—Linker loam, 3 to 5 percent slopes, eroded

Map Unit Setting

Major land resource area: 116A
Elevation: 500 to 2,800 feet
Mean annual precipitation: 43 to 50 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 175 to 210 days

Major Component Description

Linker
Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes
Parent material: Loamy residuum weathered from sandstone
Slope: 3 to 5 percent
Runoff: High
Soil depth: 20 to 40 inches to bedrock (lithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Impermeable
Drainage class: Well drained
Available water capacity: About 4.9 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 4e
Ecological site number and name: R116AY875OK, Reseeded Sandy Savannah PE 72-80
Typical profile:
Ap—0 to 6 inches; loam
Bt—6 to 30 inches; loam
BC—30 to 34 inches; sandy clay loam
R—34 to 40 inches; bedrock

M-W—Miscellaneous water

Map Unit Setting

Major land resource area: 116A
Elevation: 850 to 1,200 feet
Mean annual precipitation: 32 to 36 inches
Mean annual air temperature: 60 to 61 degrees F
Frost-free period: 200 to 210 days

Major Component Description

Miscellaneous water
Extent: 100 percent of the map unit
Definition: This unit consists of bodies of nonpottable water.
Geomorphic setting: Sewage lagoons
Land capability classification, nonirrigated: 8

MasA—Mason silt loam, 0 to 1 percent slopes, rarely flooded

Map Unit Setting

Major land resource area: 112
Elevation: 500 to 1,000 feet
Mean annual precipitation: 36 to 43 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 190 to 220 days

Major Component Description

Mason
Extent: 100 percent of the map unit
Geomorphic setting: Flood plains in river valleys
Parent material: Silty alluvium
Slope: 0 to 1 percent
Runoff: Low
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow
Slowest permeability class within a depth of 80 inches: Moderately slow
Drainage class: Moderately well drained
Available water capacity: About 10.9 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: Rare
Ponding: None
Land capability classification, nonirrigated: 1
Ecological site number and name: R112XY050OK, Loamy Bottomland PE 62-80
Typical profile:
A—0 to 11 inches; silt loam
Bt1—11 to 28 inches; silty clay loam
Bt2—28 to 89 inches; silty clay loam

Oc—Osage clay, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

Major land resource area: 112
Elevation: 500 to 1,000 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 54 to 61 degrees F
Frost-free period: 160 to 200 days

Major Component Description

Osage
Extent: 99 percent of the map unit
Geomorphic setting: Flood plains in river valleys
Parent material: Clayey alluvium
Slope: 0 to 1 percent
Runoff: Very high
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Very slow
Drainage class: Poorly drained
Available water capacity: About 6.3 inches
Depth to the top of the seasonal high water table: 0.0 to 1.0 foot
Flooding: Occasional
Ponding: None
Land capability classification, nonirrigated: 5w
Ecological site number and name: R112XY045OK, Heavy Bottomland PE 62-80
Typical profile:
A—0 to 12 inches; clay
C—12 to 62 inches; clay

Additional Components

Razort soils: 1 percent of the map unit

PaA—Parsons silt loam, 0 to 1 percent slopes

Map Unit Setting

Major land resource area: 112
Elevation: 500 to 1,200 feet
Mean annual precipitation: 37 to 45 inches
Mean annual air temperature: 57 to 65 degrees F
Frost-free period: 190 to 220 days

Major Component Description

Parsons
Extent: 99 percent of the map unit
Geomorphic setting: Paleoterraces on uplands
Position on the landform: Treads
Parent material: Clayey alluvium and/or residuum weathered from shale
Slope: 0 to 1 percent
Runoff: Very high
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow
Slowest permeability class within a depth of 80 inches: Very slow
Drainage class: Somewhat poorly drained
Available water capacity: About 10.5 inches
Depth to the top of the seasonal high water table: 0.5 to 1.5 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 3s
Ecological site number and name: R112XY010OK, Claypan Prairie PE 62-80
Typical profile:
Ap—0 to 10 inches; silt loam
E—10 to 14 inches; silt loam
Bt—14 to 46 inches; silty clay
C—46 to 62 inches; clay

Additional Components

Taloka soils: 1 percent of the map unit

PIT—Pits

Map Unit Setting

Major land resource area: 116A
Elevation: 500 to 2,200 feet
Mean annual precipitation: 22 to 48 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 190 to 240 days

Major Component Description

Pits
Extent: 100 percent of the map unit
Geomorphic setting: Borrow pits
Parent material: Mine spoil or earthy fill
Slope: 0 to 4 percent
Runoff: High
Land capability classification, nonirrigated: 8

So—Sogn silty clay loam, 1 to 12 percent slopes

Map Unit Setting

Major land resource area: 112
Elevation: 800 to 2,000 feet
Mean annual precipitation: 29 to 38 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 160 to 200 days

Major Component Description

Sogn
Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes
Parent material: Loamy residuum weathered from limestone
Slope: 1 to 12 percent
Runoff: Very high
Soil depth: 4 to 20 inches to bedrock (lithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Impermeable
Drainage class: Somewhat excessively drained
Available water capacity: About 1.6 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 7s
Ecological site number and name: R112XY098OK, Very Shallow (Eastern) PE 62-80
Typical profile:
A—0 to 7 inches; silty clay loam
R—7 to 20 inches; bedrock

SuA—Apperson silty clay loam, 0 to 1 percent slopes

Map Unit Setting

Major land resource area: 112
Elevation: 800 to 1,200 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 190 to 220 days

Major Component Description

Apperson
Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Summits
Parent material: Calcareous clayey residuum weathered from limestone
Slope: 0 to 1 percent
Runoff: Very high
Soil depth: 40 to 60 inches to bedrock (lithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow
Slowest permeability class within a depth of 80 inches: Impermeable
Drainage class: Somewhat poorly drained
Available water capacity: About 9.4 inches
Depth to the top of the seasonal high water table: 1.5 to 2.0 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 2s
Ecological site number and name: R112XY010OK, Claypan Prairie PE 62-80
Typical profile:
A—0 to 14 inches; silty clay loam
Bw1—14 to 24 inches; silty clay loam
Bw2—24 to 48 inches; silty clay
C—48 to 56 inches; silty clay
R—56 to 60 inches; bedrock

SuB—Apperson silty clay loam, 1 to 3 percent slopes

Map Unit Setting

Major land resource area: 112
Elevation: 800 to 1,200 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 190 to 220 days

Major Component Description

Apperson
Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Shoulders
Parent material: Calcareous clayey residuum weathered from limestone
Slope: 1 to 3 percent
Runoff: Very high

Soil depth: 40 to 60 inches to bedrock (lithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow
Slowest permeability class within a depth of 80 inches: Impermeable
Drainage class: Somewhat poorly drained
Available water capacity: About 9.4 inches
Depth to the top of the seasonal high water table: 1.5 to 2.0 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 2e
Ecological site number and name: R112XY010OK, Claypan Prairie PE 62-80
Typical profile:
A—0 to 14 inches; silty clay loam
Bw1—14 to 24 inches; silty clay loam
Bw2—24 to 48 inches; silty clay
C—48 to 56 inches; silty clay
R—56 to 60 inches; bedrock

SuC—Apperson silty clay loam, 3 to 5 percent slopes

Map Unit Setting

Major land resource area: 112
Elevation: 800 to 1,200 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 190 to 220 days

Major Component Description

Apperson
Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes
Parent material: Calcareous clayey residuum weathered from limestone
Slope: 3 to 5 percent
Runoff: Very high
Soil depth: 40 to 60 inches to bedrock (lithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow
Slowest permeability class within a depth of 80 inches: Impermeable
Drainage class: Somewhat poorly drained
Available water capacity: About 9.4 inches
Depth to the top of the seasonal high water table: 1.5 to 2.0 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 3e
Ecological site number and name: R112XY010OK, Claypan Prairie PE 62-80
Typical profile:
A—0 to 14 inches; silty clay loam
Bw1—14 to 24 inches; silty clay loam
Bw2—24 to 48 inches; silty clay
C—48 to 56 inches; silty clay
R—56 to 60 inches; bedrock

SuC2—Apperson silty clay loam, 3 to 5 percent slopes, eroded

Map Unit Setting

Major land resource area: 112
Elevation: 800 to 1,200 feet
Mean annual precipitation: 36 to 44 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 190 to 220 days

Major Component Description

Apperson
Extent: 100 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes
Parent material: Calcareous clayey residuum weathered from limestone
Slope: 3 to 5 percent
Runoff: Very high
Soil depth: 40 to 60 inches to bedrock (lithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow
Slowest permeability class within a depth of 80 inches: Impermeable
Drainage class: Somewhat poorly drained
Available water capacity: About 9.4 inches
Depth to the top of the seasonal high water table: 1.5 to 2.0 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 3e
Ecological site number and name: R112XY810OK, Reseeded Claypan PE 62-80
Typical profile:
A—0 to 14 inches; silty clay loam
Bw1—14 to 24 inches; silty clay loam
Bw2—24 to 48 inches; silty clay
C—48 to 56 inches; silty clay
R—56 to 60 inches; bedrock

Ta—Stigler silt loam, 0 to 1 percent slopes

Map Unit Setting

Major land resource area: 116A
Elevation: 500 to 1,100 feet
Mean annual precipitation: 36 to 54 inches
Mean annual air temperature: 60 to 64 degrees F
Frost-free period: 190 to 220 days

Major Component Description

Stigler
Extent: 100 percent of the map unit
Geomorphic setting: Paleoterraces on uplands
Position on the landform: Treads
Parent material: Loamy and clayey alluvium and/or colluvium over sandstone and shale
Slope: 0 to 1 percent
Runoff: Negligible

Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow
Slowest permeability class within a depth of 80 inches: Very slow
Drainage class: Somewhat poorly drained
Available water capacity: About 10.2 inches
Depth to the top of the seasonal high water table: 1.0 to 2.0 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 3s
Ecological site number and name: R116AY092OK Smooth Chert Savannah PE 72-80
Typical profile:
Ap—0 to 6 inches; silt loam
E—6 to 12 inches; silt loam
BE—12 to 18 inches; silty clay loam
Bt—18 to 37 inches; silty clay loam
Btg—37 to 65 inches; silty clay loam

TkA—Taloka silt loam, 0 to 1 percent slopes

Map Unit Setting

Major land resource area: 112
Elevation: 500 to 1,200 feet
Mean annual precipitation: 37 to 45 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 190 to 220 days

Major Component Description

Taloka
Extent: 100 percent of the map unit
Geomorphic setting: Paleoterraces on uplands
Position on the landform: Treads
Parent material: Loamy and clayey alluvium and/or colluvium derived from sandstone and shale
Slope: 0 to 1 percent
Runoff: Very high
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow
Slowest permeability class within a depth of 80 inches: Very slow
Drainage class: Somewhat poorly drained
Available water capacity: About 11.0 inches
Depth to the top of the seasonal high water table: 0.5 to 2.0 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 3s
Ecological site number and name: R112XY059OK, Loamy Prairie (Northeast) PE 62-80
Typical profile:
A—0 to 8 inches; silt loam
E—8 to 20 inches; silt loam
Bt1—20 to 32 inches; silt loam
Bt2—32 to 42 inches; silty clay
BC—42 to 70 inches; silty clay

W—Water

Map Unit Setting

Major land resource area: 116A
Elevation: 250 to 4,000 feet
Mean annual precipitation: 22 to 48 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 190 to 240 days

Major Component Description

Water
Extent: 100 percent of the map unit
Geomorphic setting: Valleys
Land capability classification, nonirrigated: 8

Use and Management of the Soils

For general and detailed information regarding the use and management of the map units in this survey, see the soil reports and report descriptions on the Web Soil Survey at http://websoilsurvey.nrcs.usda.gov. A soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information developed during a soil survey can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Interpretive ratings help engineers, planners, and others understand how soil properties influence important nonagricultural uses, such as building site development and construction materials. The ratings indicate the most restrictive soil features affecting the suitability of the soils for these uses.

Soils are rated in their natural state. Only normal practices for the rated use are considered. Unusual modifications to the site or soil material are not considered in the ratings. Where soils have limitations, engineers and others may be able to modify soil features or adjust the plans for a structure to compensate for most of the limitations. Most of these modifications, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use a survey to locate sources of sand, gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find a soil survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Rangeland

Mark Moseley, range conservationist, Natural Resources Conservation Service, helped prepare this section.

Range, grazed forestland, and native pasture provide forage for livestock in the survey area.

Range is defined as land on which the native vegetation (the climax, or natural potential, plant community) is predominantly grasses, grasslike plants, forbs, and shrubs suitable for grazing and browsing. Range includes natural grasslands, savannas, many wetlands, some deserts, tundra, and certain shrub and forb communities. Range receives no regular or frequent cultural treatment. The composition and production of the plant community are determined by soil, climate, topography, overstory canopy, and grazing management.

Grazed forestland is defined as land on which the understory includes, as an integral part of the forest plant community, plants that can be grazed without significant impairment of other forest values.

Native pasture is defined as land on which the potential (climax) vegetation is forest but which is used and managed primarily for the production of native forage plants. Native pasture includes cutover forestland and forestland that has been cleared and is managed for native or naturalized forage plants.

Most of the local ranches and livestock farms are cow-calf operations. There are also some pure stocker enterprises and some ranches that diversify their cow-calf operation with stockers to provide greater flexibility.

Several livestock operations supplement the grazing of native rangeland with introduced grasses, such as bermudagrass and “plains” bluestem. Forage crops are also used. Protein, hay, and small-grain crops are used to supplement livestock through winter.

Droughts of varying lengths occur, and short-term summer droughts are common. Longer periods of drought, some lasting several months, are also frequent.

The pre-settlement vegetation evolved with periodic natural fires, droughts, migratory grazing by bison, and impact from many other wildlife species. The bison would heavily impact an area and then move to other grazing range.

Early settlement brought continuous grazing and eliminated much of the high-quality vegetation on some ecological sites. Areas that were once open-savannah ecological sites with a mixture of grasses, forbs, and scattered trees are now covered with oaks, a few tall and mid grasses, and low successional grasses and forbs. Some prairie sites are now growing low successional grasses and forbs instead of tall grasses. The amount of forage presently produced may be less than half of that originally produced. On some sites, the number of eastern redcedar has increased significantly due to a lack of prairie fires. Remnants of the original plant species are still found on most rangeland, however, and progressive grazing management can allow these high quality plants to re-establish without reseeding.

The table “Rangeland Productivity and Characteristic Plant Communities” is available on the Soil Data Mart at http://soildatamart.nrcs.usda.gov. This table shows, for each soil, the ecological site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. Explanation of the column headings in this table follows.

An *ecological site* for rangeland is a distinctive kind of land and vegetation with specific physical characteristics that makes it different from other kinds of land in its ability to produce a distinctive kind and amount of vegetation.

Many different ecological sites are in the survey area. Over time, the combination of plants best suited to a particular soil and climate has become dominant. If the soil is not excessively disturbed, this group of plants is the natural plant community for the site. Natural plant communities are not static but vary slightly from year to year and place to place.

The relationship between soils and vegetation was ascertained during this survey; thus, ecological sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. The “Electronic Field Office Technical Guide,” which is available at the local office of the Natural Resources Conservation Service or online at http://www.nrcs.usda.gov/technical/efotg/, can provide specific information about ecological sites.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year’s growth of leaves, twigs, and fruit of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are near the historical monthly average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture. Figure 2 shows a typical growth curve that represents the percentage of total growth that occurs each month for native vegetation and other forage. Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as stage of maturity, exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation consists of the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil. The plants are listed by

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
IMPROVED BERMUDAGRASS				5	25	35	20	10	5			
WEEPING LOVEGRASS			3	20	25	20	15	6	11			
INTRODUCED BLUESTEM				3	15	26	22	18	10	1		
SMALL GRAIN GRAZEOUT	3	9	29	27	18				1	4	6	3
FORAGE SORGHUM						14	33	33	20			
NATIVE GRASS	1	1	2	10	20	27	16	8	5	2	2	1

Figure 2.—Typical growth curves for various kinds of forage in the survey area. The growth curve for each kind of forage indicates the percentage of the total annual growth that occurs each month.

common name. Under composition, the anticipated percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Similarity Index

The similarity index indicates on a percentage basis the extent to which the present plant community resembles a specified vegetative state on an ecological site. The Natural Resources Conservation Service uses similarity index two ways.

The first use compares the present vegetation on an ecological site to the presumed historic vegetation for that site. A similarity index of 70 would suggest that the present plant community contains 70 percent of the presumed historic plant community for that site. This comparison provides a basis for examining the extent and direction of changes between current vegetation and historic vegetation.

The second use measures how near the current plant community is to the landowners goal for the land. The management goal for rangeland is not necessarily a similarity index of 100 as compared to the historic plant community. Therefore, the similarity index can represent the percentage of the plant community that resembles a desired plant community.

Abnormal disturbances that change the natural plant community include repeated overuse by livestock, excessive burning, erosion, and cultivation. Grazing animals select the most palatable plants. These plants eventually die if they are continually grazed at a severity that does not allow for recovery. A very severe disturbance can completely destroy the natural community. Under such conditions, the less desirable plants, such as annuals and weed-like plants, can increase in abundance. If the plant community and the soils have not deteriorated significantly and proper range management is applied, the site can eventually return to predominantly natural plants.

Knowledge of the ecological site is necessary as a basis for planning and applying the management needed to maintain or improve the desired plant community for selected uses. Such information is needed to support management objectives, planned grazing systems, stocking rates, and wildlife management practices; to improve the potential of an area for recreational uses; and to improve the condition of watersheds.

Rangeland Management

Rangeland management requires a knowledge of the kinds of soil in an area and of the potential natural plant community. It also requires an evaluation of the similarity index.

Effective range management conserves rainfall, enhances water quality, reduces the hazard of downstream flooding, improves yields, provides forage for livestock and wildlife, enhances recreational opportunities, and protects the soil. The main management concern is recognizing important changes in the plant cover or the range trend. These changes occur gradually and can be overlooked.

Each range manager should evaluate the type of plant community that best supports the ranch and then apply management and ecological principles to achieve the goals. The desired plant community should be within the capabilities of the land.

The range management practices used in Adair County include prescribed grazing, stock-water developments, and fences. If undesirable plants become dominant, range seeding, brush management, or prescribed burning are commonly used.

Range management includes four major considerations:

- *Grazing distribution,* which is achieved by managing livestock to graze all parts of the grazing unit equally.
- *Selective grazing,* which occurs because animals graze preferred plants to balance their diets. If selective grazing occurs repeatedly, the preferred plants are damaged.
- *Proper stocking rates,* which are achieved by balancing animal numbers with forage production.
- *Rest periods,* during which grazed plants are given enough rest to recover and to maintain growth.

An important principle of range management is that forage production is controlled by rainfall while composition is determined by grazing management.

The setting of stocking rates is not an exact science because of influences from grazing management, season of use, mix of livestock, and seasonal production of forage. Some general rules, however, can be helpful. To maintain a nutritional cover of plants, about 50 percent of the annual growth of the most important grazing plants should remain at the end of the grazing season. Plants can be removed not only through grazing by livestock but also through grazing by rodents, insects, and wildlife and through the deterioration caused by climatic variations. Because of these factors, a safe initial stocking rate for livestock should be calculated on the basis of 25 percent of the total annual growth, by weight, of the vegetation.

For example, production could be 3,500 pounds per acre of air-dry grasses, forbs, and limited woody species for an average season on a Loamy Prairie ecological site with a similarity index of 70 to the historic plant community. Twenty-five percent of this production would be 875 pounds per acre.

A 1,000-pound cow and her calf is equivalent to one animal unit (AU) and consume about 2.6 percent of her body weight (26 pounds) of forage per day. Therefore, in 1 month an animal unit could consume 790 pounds of native vegetation, depending on the quality and stage of growth of the plants (26 pounds per day times 365 days per year divided by 12 months per year).

Dividing 875 pounds (the forage allocation) by 26 pounds (the forage required per day for 1 animal unit) suggests that 1 acre of Loamy Prairie ecological site with a similarity index of 70 would feed 1 cow and calf for 33.6 days. To convert forage available from 1 acre to animal unit months (AUM), the available forage (875 pounds) is divided by the amount required to feed 1 animal unit for 1 month (790 pounds). Therefore, 1 acre would provide 1.1 AUM of grazing and 10.9 acres would feed 1 cow and calf for 12 months.

Another approach is to calculate the annual forage needs of an animal unit (790 pounds per month times 12 months equals 9,490 pounds). Dividing the 875 pounds of usable forage per acre into the 9,490 pounds needed by the cow and calf reveals that approximately 10.9 acres is needed for 1 cow annually. Stocking rate calculations should be adjusted for animal size, grazing system, and grazing season.

More information about planning a grazing program is available from the local office of the Natural Resources Conservation Service.

Ecological Site Descriptions

Eleven ecological sites are recognized in Adair County. The ecological site identifier has eleven characters. The “R” indicates an ecological site. The next four characters identify the major land resource area. The sixth character identifies the major land resource unit subdivision. The next three characters identify the individual ecological site number. The final two characters identify the state. The identifier is followed by the proper name for the ecological site. The following descriptions include a list of the plants that are characteristic of the sites. Detailed ecological site descriptions are available at the local office of the Natural Resources Conservation Service.

R112XY010OK, Claypan Prairie PE 62-80.—This site is in nearly level to moderately sloping areas on uplands. The historic climax vegetation includes little bluestem, big bluestem, switchgrass, Indiangrass, meadow dropseed, tall dropseed, and Scribner's panicum. The legumes include scurfpea, Illinois bundleflower, and leadplant. The forbs include black sampson, dotted gayfeather, heath aster, ashy sunflower, and wild indigo. The woody species include poison ivy.

R112XY045OK, Heavy Bottomland PE 62-80.—This site is on bottomlands that are often overflowed. The soils are deep and clayey. The historic climax vegetation includes big bluestem, Indiangrass, eastern gamagrass, prairie cordgrass, switchgrass, Canada wildrye, Virginia wildrye, meadow dropseed, and broomsedge bluestem. The forbs include Baldwin's ironweed and white snakeroot. The main woody species include elm, ash, oak, walnut, and pecan.

R112XY050OK, Loamy Bottomland PE 62-80.—This site is in areas of deep, loamy soils on bottomlands. The historic climax vegetation includes big bluestem, Indiangrass, switchgrass, eastern gamagrass, prairie cordgrass, beaked panicum, Canada wildrye, Virginia wildrye, and switchcane. The legumes include leadplant and Illinois bundleflower. The forbs include goldenrod, wholeleaf rosinweed, black sampson, and Maximilian sunflower. The woody species include American elm, green ash, pecan, and oak.

R112XY059OK, Loamy Prairie (Northeast) PE 62-80.—This site is in areas of nearly level to moderately steep uplands. It is on convex slopes of low ridges and on the side slopes of moderately steep ridges in broad valleys. The historic climax vegetation includes big bluestem, little bluestem, Indiangrass, switchgrass, jointtail grass, purpletop, and dropseed species.

R112XY098OK, Very Shallow, (Eastern) PE 62-80.—This site is in areas of nearly level to gently sloping, very shallow soils. The surface layer is typically 6 to 10 inches deep over limestone. The soils in areas of this site have low available water capacity, which results in a historic climax vegetation that includes such species as hairy grama, blue grama, and sideoats grama. Big bluestem, little bluestem, Indiangrass, switchgrass, and other grasses are in crevices of the deeper soils. The forbs include cobaea penstemon, willowleaf sunflower, and dotted gayfeather. Puffsheath dropseed and evax are common annuals.

R112XY810OK, Eroded Claypan Prairie PE 62-80.—This site is in areas of R112XY010OK, Claypan Prairie PE 62-80, that have been subject to erosion. Part or all of the A horizon has been removed from the soil. The soil integrity has been disturbed. Because of the past erosion and the probability of further erosion, the plant community can only be determined by onsite inspection. See R112XY010OK, Claypan Prairie PE 62-80, for the plant communities on the parent site.

R116AY059OK, Loamy Prairie (Northeast) PE 72-80.—This site is in level to gently rolling areas. The historic climax vegetation includes sand bluestem, little bluestem, Indiangrass, switchgrass, prairie dropseed, jointtail grass, purpletop, tall dropseed, and sideoats grama.

R116AY075OK, Sandy Savannah PE 72-80.—This site has a plant community that consists of tall grasses and a 15 to 20 percent overstory of scattered oak and hickory trees. The historic climax vegetation includes big bluestem, Indiangrass, little bluestem, switchgrass, purpletop, sideoats grama, bearded skeletongrass, tall dropseed, hidden dropseed, Canada wildrye, Virginia wildrye, Texas bluegrass, and flatsedge species. The legumes include Virginia tephrosia, slender lespedeza, roundhead lespedeza, trailing lespedeza, and sessile-leaved tickclover. The woody species include post oak, blackjack oak, elm, hickory, ash, bumelia, coralberry, greenbrier, poison ivy, Virginia creeper, and grape.

R116AY088OK, Shallow Savannah PE 72-80.—This site is in areas of rugged topography on low, mountainous ridges, typically oriented easterly to westerly. The historic climax plant community consists of an open stand of post oak, blackjack oak, and associated hardwoods with an understory of tall grasses. The historic climax vegetation includes big bluestem, little bluestem, and Indiangrass. Shortleaf pine grows on the dry edge of the humid zone.

R116AY092OK, Smooth Chert Savannah PE 72-80.—This site is in areas of cherty soils on uplands on the more gently sloping ridges and footslopes of the Ozark Highlands. The historic climax vegetation includes big bluestem, little bluestem, and Indiangrass. The main browse and forbs are Jersey tea, St. Johnswort, goldenrods, asters, and perennial legumes. The woody species include post oak, blackjack oak, elm, shortleaf pine, white oak, red oak, and hickory. The shrubby species include sumac, coralberry, grape, Virginia creeper, hawthorn, and blackhaw.

R116AY875OK, Eroded Sandy Savannah PE 72-80.—This site is in areas of R116AY075OK, Sandy Savannah PE 72-80, that have been subject to erosion. Part or all of the A horizon has been removed from the soil. The soil integrity has been disturbed. Because of the past erosion and the probability of further erosion, the plant community can only be determined by onsite inspection. See R116AY075OK, Sandy Savannah PE 72-80, for the plant communities on the parent site.

Formation and Classification of the Soils

This section summarizes the major factors of soil formation and describes the system of soil classification. The classification of each soil in the survey area is shown in the table “Classification of the Soils” at the end of this section. The Official Soil Series Descriptions, including the range of important characteristics of the soils, for the series in this survey area are online at http://soils.usda.gov/technical/classification/osd/. Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, which is typical of the series 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).

Formation of the Soils

Soil is produced by the action of soil-forming processes on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent materials; 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 the forces of soil development have acted on the soil material.

Climate and vegetation are the active factors of soil formation. They act on parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and vegetation are conditioned by relief. Parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into a soil profile. The time may be long or short, but some time is always required for differentiation of horizons. Generally, a long time is required for the development of distinct horizons.

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

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999 and 2003). 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 described 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 Alfisol.

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 Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Paleudalfs (*Pale*, meaning excessive horizonation, plus *udalf*, the suborder of the Alfisols that has a udic moisture regime).

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

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

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

Table 5.--Classification of the Soils

Soil name	Family or higher taxonomic class
Apperson	Fine, smectitic, thermic Aquic Hapluderts
Britwater	Fine-loamy, mixed, active, mesic Typic Paleudalfs
Captina	Fine-silty, siliceous, active, mesic Typic Fragiudults
Clarksville	Loamy-skeletal, siliceous, semiactive, mesic Typic Paleudults
Craig	Clayey-skeletal, mixed, active, thermic Mollic Paleudalfs
Elsah	Loamy-skeletal, mixed, superactive, nonacid, mesic Typic Udifluvents
Hector	Loamy, siliceous, subactive, thermic Lithic Dystrudepts
Jay	Fine-silty, mixed, active, thermic Oxyaquic Fragiudalfs
Linker	Fine-loamy, siliceous, semiactive, thermic Typic Hapludults
Mason	Fine-silty, mixed, active, thermic Pachic Argiudolls
Osage	Fine, smectitic, thermic Typic Epiaquerts
Parsons	Fine, mixed, active, thermic Mollic Albaqualfs
Razort	Fine-loamy, mixed, active, mesic Mollic Hapludalfs
Sogn	Loamy, mixed, superactive, mesic Lithic Haplustolls
Stigler	Fine, mixed, active, thermic Aquic Paleudalfs
Taloka	Fine, mixed, active, thermic Mollic Albaqualfs
Tonti	Fine-loamy, mixed, active, mesic Typic Fragiudults
Waben	Loamy-skeletal, siliceous, active, mesic Ultic Hapludalfs

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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 at local offices of the Natural Resources Conservation Service or on the Internet).

ABC soil. A soil having an A, a B, and a C horizon.
AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.
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.
Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.
Alluvial fan. A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.
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. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp. A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Badland. A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

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 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).

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.

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.

Breaks. A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

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.

Butte. An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Canyon. A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

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.

Clay beds. Old, buried, alluvial clay sediments.

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 fragments. Mineral or rock particles larger than 2 millimeters in diameter.

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.

COLE (coefficient of linear extensibility). See Linear extensibility.

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.

Conglomerate. A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

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.

Cuesta. An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Deflocculation. Dispersion, or breaking up , of soil aggregates into individual particles. Sodium salts, for example, deflocculate, or disperse, granulated particles of clay to form a clay that runs together, or puddles.

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.

Diatomaceous earth. A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of 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.

Drainageway. A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw. A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

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.

Dune. A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

Earthy fill. See Mine spoil.

Ecological site. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

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 surface. A land surface shaped by the action of erosion, especially by running water.

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.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan remnant. A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

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.

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*.

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

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.

Foothills. A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope. The concave surface at the base of a hillslope. 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.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

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.

Gilgai. Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

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.

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. The overland waterflow is converging.

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.

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.

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.

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.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

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; 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.

Internal soil drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers and by the height of the water table, either permanent or perched. Relative terms for expressing internal drainage are *none, very slow, slow, medium, rapid,* and *very rapid.*

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

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.

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.

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.

K_{sat}. Saturated hydraulic conductivity. (See Permeability.)

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

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.

Lamellae. Thin bands of fibers of translocated clay that constitute illuvial, and in many cases argillic, horizons in sandy upland soils.

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.

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.

Map unit. Any soil, miscellaneous land type, soil complex, or undifferentiated soil group shown on a detailed soil map and identified by a symbol.

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.

Mass movement. A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

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.

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.

Mesa. A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

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.

Miscellaneous land type. A map unit consisting of areas of land that have little or no natural soil, that are too nearly inaccessible for orderly examination, or that occur where, for other reasons, it is not feasible to classify the soil.

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.

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).

Mountain. A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

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.

Natural drainage. Refers to conditions that existed during the development of a soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural drainage are recognized.

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. 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.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

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

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.

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. In soil physics, the rate is referred to as “saturated hydraulic conductivity,” which is defined in the “Soil Survey Manual.” In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as “permeability.” Terms describing permeability, measured in inches per hour, are as follows:

Impermeable	less than 0.0015 inch
Very slow	0.0015 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

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.

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.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

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.

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.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

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

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

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.

Rippable. Rippable bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200–300 drawbar horsepower rating.

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.

Saturated hydraulic conductivity (K_{sat}). See Permeability.

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.

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.

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. A shoulder is a transition from summit to backslope.

Shrub-coppice dune. A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology). A geomorphic component of hills consisting of a laterally planar area of a hillside. 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.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

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.

Similarity index. The present composition of the plant community on an ecological site in relation to the potential natural plant community for that site. Similarity index is expressed as *excellent, good, fair,* or *poor,* on the basis of how much the present plant community has departed from the potential.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (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. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 1 percent
Very gently sloping	1 to 3 percent
Gently sloping	3 to 5 percent
Moderately sloping	5 to 8 percent
Strongly sloping	8 to 12 percent
Moderately steep	12 to 20 percent
Steep	20 to 45 percent
Very steep	45 percent and higher

Classes for complex slopes are as follows:

Nearly level	0 to 3 percent
Gently undulating	1 to 5 percent
Undulating	1 to 8 percent
Gently rolling	5 to 12 percent
Rolling	5 to 15 percent
Hilly	8 to 30 percent
Steep	20 to 45 percent
Very steep	45 percent and higher

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.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to Ca^{++} + Mg^{++}. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

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.

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 grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind 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.

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.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. The topographically highest position of a hillslope. 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.

Talus. Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

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.

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."

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. 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.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water-holding capacity. See Available water capacity.

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.

Windthrow. The uprooting and tipping over of trees by the wind.

Winnowing. The removal of clay and silt particles from the soil by strong winds. The coarser particles remain, and the soil becomes sandier and more highly erodible as the process continues.

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