Soil Survey of Fort Defiance Area, Parts of Apache and Navajo Counties, Arizona, and McKinley and San Juan Counties, New Mexico
How To Use This Soil Survey

Detailed Soil Maps

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

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

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the Contents, which lists the map units by symbol and name and shows the page where each map unit is described.

The Contents shows which table has data on a specific land use for each detailed soil map unit. Also see the Contents for sections of this publication that may address your specific needs.

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.
This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey. This survey was made cooperatively by the Bureau of Indian Affairs, the Natural Resources Conservation Service, and the Arizona Agriculture Experiment Station. The survey is part of the technical assistance furnished to the Navajo Nation, Arizona and New Mexico.

Major fieldwork for this soil survey was completed in 1993. Soil names and descriptions were approved in December 2007. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1998. The most current official data are available on the Internet.

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

**Nondiscrimination Statement**

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**Cover:** A classic view of Window Rock, the formation that gave the Navajo Nation capital city its name. This natural arch was formed by wind eroding into the Jurassic age Cow Springs Sandstone (Thaden, R.E., 1990). The Window Rock is in map unit Rock outcrop-Vessilla complex, 35 to 70 percent slopes. In the foreground is map unit Doakum family-Betonnie complex, 1 to 8 percent slopes. Photo by Jerome Willie, Rangeland Management Specialist, Fort Defiance Agency, Bureau of Indian Affairs.
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Soil surveys contain information that affects land use planning in survey areas. They include predictions of soil behavior for selected land uses. The surveys highlight soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

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

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

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

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

David L. McKay
State Conservationist
Natural Resources Conservation Service
Soil Survey of Fort Defiance Area, Parts of Apache and Navajo Counties, Arizona, and McKinley and San Juan Counties, New Mexico

United States Department of the Interior, Bureau of Indian Affairs in cooperation with the United States Department of Agriculture, Natural Resources Conservation Service, and the Arizona Agricultural Experiment Station.

This survey was made for the Navajo Nation, Arizona and New Mexico, by the Bureau of Indian Affairs. It is part of the technical assistance furnished to the Navajo Nation.

General Nature of the Survey Area

The Fort Defiance soil survey covers approximately 3,210,000 acres, or 5,015 square miles, of the Navajo Nation. This includes parts of Apache and Navajo Counties in the northeastern part of Arizona, and parts of McKinley and San Juan Counties in northwestern New Mexico (fig. 1). There are 2,433,760 acres in Arizona, of which 1,594,368 acres are in Apache County, and 839,392 are in Navajo County. In New Mexico, there are 776,240 acres, of which 549,240 acres are in McKinley County and 227,000 are in San Juan County. Window Rock, the capital of the Navajo Nation, is within the survey area, as are Grazing Districts 7, 17, 18, and 14.

Elevations in the survey area range from a low of about 5,600 feet along the Puerco River to above 9,800 feet in the Chuska Mountains. Most areas range from 6,000 to 7,300 feet in elevation.

The survey area is mainly rangeland within the Colorado Plateau physiographic province. It is characterized by rough, broken terrain, including steep mountainous areas, plateaus, cuestas, and mesas intermingled with steep canyon walls,
escarpments, and valleys. The survey area has been subject to volcanic activity, expressed as volcanic plugs such as those in the Hopi Buttes area.

The survey area has very little perennial surface water. Small lakes, such as Asaayi Lake and many small seasonally filled ponds can be found in the Chuska Mountains. Major watersheds are the Little Colorado River and its many tributaries, including the Puerco River in Arizona and New Mexico and many small tributaries that come off the east slopes of the Chuska Mountains and join with the Chaco River in New Mexico.

Coal mining, commercial woodcutting, tourism, and ranching are the most important enterprises in the survey area. The major coal mining area is on Black Mesa. The ranches are mainly cow-calf enterprises, but some are yearling operations. The survey area has very few acres of irrigated cropland and non-irrigated cropland. The main crops are alfalfa hay and winter wheat. The main factors that restrict land use for crops are a short growing season, low rainfall, and inadequate irrigation.

Transportation Facilities

Three state highways currently serve the survey area. They are Arizona Highway 191, which runs north and south from Chambers, Arizona on US Highway 40 to the Utah border; Arizona Highway 12, which runs north from Lupton, Arizona on US Highway 40 to Round Rock where it intersects with Highway 191; and SR 264, which runs east and west from Ya-ta-hey, New Mexico to Kykotsmovi, Arizona. A small airport is located in Window Rock. The nearest bus and railroad service is in Gallup, New Mexico.

Climate

Prepared by the Natural Resources Conservation Service National Water and Climate Center, Portland, Oregon.

Climate tables are created from climate stations located at Chaco Canyon National Monument, Gallup, and Otis, New Mexico; and at Window Rock 4SW, Arizona.

Thunderstorm days, relative humidity, percentage of sunshine, and wind information are estimated from First Order station Albuquerque, New Mexico. [Table 1] shows, for each station, data on temperature and precipitation for the survey area in the period 1971 to 2000. [Table 2] shows probable dates of the first freeze in fall and the last freeze in spring. [Table 3] provides data on the length of the growing season.

In winter, average temperatures at Chaco Canyon, Gallup, Otis, and Window Rock are 30.2, 30.6, 30.5, and 30.8 degrees F, respectively. The average daily minimum temperatures in winter are 15.1, 14.9, 20.7, and 16.9 degrees at these four stations. The lowest temperatures on record were -38 degrees at Chaco Canyon on December 12, 1961; -34 degrees at Gallup on December 23, 1990; -21 degrees at Otis on January 13, 1963; and -29 degrees at Window Rock, also on January 13, 1963.

In summer, average temperatures at Chaco Canyon, Gallup, Otis, and Window Rock are 69.6, 67.9, 69.0, and 67.2 degrees, respectively. The average daily maximum temperatures are 87.7, 85.6, 83.3, and 82.7 degrees at these four stations. The highest temperatures ever recorded in each station’s period of record were 104 degrees at Chaco Canyon on July 26, 1979; 100 degrees at Gallup on July 28, 1995; 99 degrees at Otis on July 7, 1981; and 99 degrees at Window Rock on June 23, 1990.

Growing degree days are shown in table 1. They are equivalent to “heat units.”
During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Average annual total precipitation across the survey area is generally between 9 and 12 inches. Specifically, the average annual values are 9.45, 11.57, 10.34, and 11.50 inches at Chaco Canyon, Gallup, Otis, and Window Rock. Of these amounts, around 4 to 5 inches, or about 40 to 50 percent of the annual total, usually falls in June through September. The growing season for most crops falls within this period. The heaviest 1-day precipitation amounts during the periods of record were 2.90 inches at Chaco Canyon on December 15, 1961; 2.36 inches at Gallup on April 16, 1988; 2.00 inches at Otis on July 25, 1994; and 2.38 inches at Window Rock on July 29, 1945. Thunderstorms occur on about 41 days each year, and most occur between May and September, with more than 22 in July and August.

Average seasonal snowfall across the survey area is generally between 15 and 35 inches. At Chaco Canyon the average annual total is 14.0 inches; at Gallup it is 33.0 inches; at Otis it is 23.4 inches; and at Window Rock it is 16.1 inches. The greatest snow depths at any one time during the periods of record were 11 inches at Chaco Canyon, recorded on May 6, 1978; 13 inches at Gallup on December 22, 1990; 15 inches at Otis on March 1, 1987; and 18 inches at Window Rock on December 20, 1967. On average, about 7 days per year have at least 1 inch of snow on the ground at Chaco Canyon; at Gallup the average is about 21 days; at Otis it is about 19 days; and at Window Rock it is about 9 days per year. The heaviest 1-day snowfalls on record were 12.0 inches at Chaco Canyon, recorded on April 1, 1949; 10.5 inches at Gallup on December 5, 1992; 10.0 inches at Otis on March 9, 1973; and 14.0 inches at Window Rock, recorded on March 30, 1970.

The average relative humidity in mid-afternoon is about 40 percent in the winter and between 15 and 20 percent in the summer. Humidity is higher at night, and the average at dawn is about 70 percent in the winter and 45 percent in the summer. The sun shines about 75 to 80 percent of the time in summer and around 65 to 70 percent in winter. The prevailing wind is from the northwest in the winter and early spring, and from the south and southeast the remainder of the year. Average wind speed is highest, around 12 miles per hour, in April.

How This Survey Was Made

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

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

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

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

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

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

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

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

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

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

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

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

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a soil series. Except for differences in texture of the surface layer, 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, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown
on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Jocity sandy clay loam, saline-sodic, 0 to 3 percent slopes, is a phase of the Jocity 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. Manuelito-Verite complex, 8 to 45 percent slopes, is an example.

An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Notal-Trail-Riverwash association, 0 to 1 percent slopes, is an example.

An undifferentiated group is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Querencia and Gish soils, 0 to 2 percent slopes, is an undifferentiated group in this survey area.

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

Soil descriptions

1—Akhoni-Venable families complex, 0 to 15 percent slopes

Map Unit Setting

Landform setting: depressions, hills, plateaus
Elevation: 8,500 to 9,200 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 40 to 43 degrees F
Frost-free period: 80 to 110 days

Map Unit Composition

Akhoni family and similar soils: 75 percent
Venable family and similar soils: 15 percent
Minor components: 10 percent
  • Bikeyah family, occasionally flooded, wet meadow
  • Berland family, ponderosa pine forest
  • Klizhin family, ponderosa pine forest
  • Akhoni family, ponderosa pine forest

Component Descriptions

Akhoni family soils
Taxonomic Classification: Loamy, mixed, superactive, frigid Lithic Haplustolls
Landform: High elevation hills on plateaus
Parent material: Slope alluvium and residuum weathered from sandstone
Slope: 1 to 15 percent
Depth to restrictive feature: 10 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 1.2 inches (very low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Pinus ponderosa/Arctostaphylos uva-ursi/Festuca arizonica-Pteridium aquilinum
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XH804AZ
Present vegetation: Kentucky bluegrass, Arizona fescue, mountain muhly, Gambel oak, bottlebrush squirreltail, rosy pussytoes, woodland strawberry, creeping barberry, fleabane, western yarrow
Land capability subclass (nonirrigated): 5c

Typical Profile:
  A—0 to 1 inch; fine sandy loam
  Bw—1 inch to 5 inches; fine sandy loam
  C—5 to 11 inches; very gravelly fine sandy loam
  R—11 to 21 inches; bedrock

Venable family soils
Taxonomic Classification: Fine-loamy, mixed, superactive Cumulic Cryaquolls
Landform: High elevation depressions on plateaus
Parent material: Lacustrine sediments and slope alluvium derived from sandstone
Slope: 0 to 1 percent
Drainage class: Very poorly drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 8.6 inches (moderate)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: Frequent
Seasonal high water table depth: About 0 to 0 inches
Runoff class: Negligible
Hydrologic group: D
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.
Present vegetation: common marestail, floating pondweed, needle spikerush, northern mannagrass
Land capability subclass (nonirrigated): 5c

Typical Profile:
- Oi—0 to 1 inch; slightly decomposed plant material
- A—1 inch to 5 inches; loam
- Bw—5 to 9 inches; clay loam
- Bg—9 to 15 inches; clay
- BCg—15 to 35 inches; sandy clay loam
- Cg1—35 to 43 inches; sandy clay loam
- Cg2—43 to 51 inches; sandy loam
- Cg3—51 to 60 inches; sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

2—Aquima-Hawaikuh silt loams, 1 to 5 percent slopes

Map Unit Setting

Landform setting: fan terraces, stream terraces, valley floors
Elevation: 6,000 to 6,400 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Aquima and similar soils: 45 percent
Hawaikuh and similar soils: 40 percent
Minor components: 15 percent
- Zia, Sandy Loam Upland 10-14” p.z.
- Suwanee, Loamy Bottom 10-14” p.z.
- Venadito, Clayey Bottom 10-14” p.z.

Component Descriptions

Aquima soils

Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocambids
Landform: Stream terraces on valley floors
Parent material: Fan and stream alluvium derived from sandstone and shale and/or
stream alluvium derived from sandstone and shale
Slope: 1 to 5 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 11.5 inches (high)
Shrink-swell potential: About 5.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 5 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains

Ecological site: Loamy Bottom 10-14" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XA112AZ

Present vegetation: blue grama, western wheatgrass, fourwing saltbush, Sporobolus, bottlebrush squirreltail, galleta, spike muhly, spike muhly, winterfat, broom snakeweed

Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 3 inches; silt loam
- AB—3 to 8 inches; silt loam
- Bw1—8 to 20 inches; silt loam
- Bw2—20 to 48 inches; silt loam
- C1—48 to 52 inches; loam
- C2—52 to 70 inches; silt loam

Hawaikuh soils

Taxonomic Classification: Fine, mixed, superactive, mesic Ustic Haplargids

Landform: Fan terraces, stream terraces

Parent material: Fan and stream alluvium derived from sandstone and shale

Slope: 1 to 5 percent

Drainage class: Well drained

Slowest permeability: .06 to 0.2 in/hr (slow)

Available water capacity: About 11.1 inches (high)

Shrink-swell potential: About 5.0 percent (moderate)

Flooding hazard: None

Ponding hazard: None

Runoff class: High

Hydrologic group: B

Calcium carbonate maximum: About 10 percent

Gypsum maximum: None

Salinity maximum: About 4 dS/m (very slightly saline)

Sodium adsorption ratio maximum: About 2 (slightly sodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains

Ecological site: Clayey Bottom 10-14" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XA104AZ

Present vegetation: alkali sacaton, western wheatgrass, blue grama, fourwing saltbush, bottlebrush squirreltail, galleta, rubber rabbitbrush

Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 2 inches; silt loam
- Bt—2 to 11 inches; silty clay
- Btk1—11 to 20 inches; clay loam
- Btk2—20 to 25 inches; clay loam
- Bk1—25 to 50 inches; silty clay loam
- Bk2—50 to 70 inches; silty clay

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
3—Arabrab-Parkelei family complex, dry, 3 to 12 percent slopes

Map Unit Setting

Landform setting: fan terraces, mesas, plateaus
Elevation: 6,400 to 7,300 feet
Mean annual precipitation: 14 to 18 inches
Mean annual air temperature: 48 to 51 degrees F
Frost-free period: 110 to 140 days

Map Unit Composition

Arabrab and similar soils: 50 percent
Parkelei family and similar soils: 40 percent
Minor components: 10 percent
• Evpark, Loamy 13-17" p.z.
• Fraguni, Sandy Upland 13-17" p.z.

Component Descriptions

Arabrab soils
Taxonomic Classification: Loamy, mixed, superactive, mesic Lithic Haplustalfs
Landform: Summits of plateaus and mesas
Parent material: Eolian material and slope alluvium derived from sandstone and shale
Slope: 3 to 7 percent
Depth to restrictive feature: 10 to 20 inches to bedrock, paralithic; 10 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 2.3 inches (very low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Shallow Loamy 13-17" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XF608AZ
Present vegetation: black sagebrush, muttongrass, blue grama, bottlebrush squirreltail, broom snakeweed, prairie junegrass, western wheatgrass, rabbitbrush, Wyoming big sagebrush
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 3 inches; very fine sandy loam
Bt1—3 to 9 inches; very fine sandy loam
Bt2—9 to 15 inches; fine sandy loam
Cr—15 to 16 inches; bedrock
R—16 to 26 inches; bedrock

Parkelei family soils

*Taxonomic Classification:* Fine-loamy, mixed, superactive, mesic Aridic Haplustalfs

*Landform:* Summits of fan terraces on plateaus, fan terraces on mesas

*Parent material:* Eolian material and fan alluvium derived from sandstone and shale

*Slope:* 3 to 12 percent

*Drainage class:* Well drained

*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)

*Available water capacity:* About 10.0 inches (high)

*Shrink-swell potential:* About 2.0 percent (low)

*Flooding hazard:* None

*Ponding hazard:* None

*Runoff class:* Medium

*Hydrologic group:* B

*Calcium carbonate maximum:* About 10 percent

*Gypsum maximum:* None

*Salinity maximum:* About 2 dS/m (nonsaline)

*Sodium adsorption ratio maximum:* About 0 (nonsodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush

*Ecological site:* Loamy Upland 13-17" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Ecological site ID:* R035XF605AZ

*Present vegetation:* Wyoming big sagebrush, western wheatgrass, blue grama, muttongrass, bottlebrush squirreltail, galleta, Colorado pinyon, Greene rabbitbrush, black sagebrush, broom snakeweed, Utah juniper

*Land capability subclass (nonirrigated):* 6c

Typical Profile:

- **A**—0 to 3 inches; very fine sandy loam
- **Bt1**—3 to 11 inches; loam
- **Bt2**—11 to 25 inches; loam
- **Bk**—25 to 60 inches; loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

4—Atlatl-Nizhoni family-Rock outcrop complex, 15 to 30 percent slopes

**Map Unit Setting**

*Landform setting:* escarpments, plateaus

*Elevation:* 7,200 to 7,800 feet

*Mean annual precipitation:* 14 to 18 inches

*Mean annual air temperature:* 48 to 51 degrees F

*Frost-free period:* 110 to 140 days

**Map Unit Composition**

Atlatl and similar soils: 45 percent

Nizhoni family and similar soils: 40 percent
Component Descriptions

Atlatl soils

Taxonomic Classification: Coarse-loamy, carbonatic, mesic Aridic Calciustepts
Landform: Escarpments on plateaus
Parent material: Eolian deposits and slope alluvium over residuum weathered from limestone and sandstone
Slope: 15 to 25 percent
Surface fragments: About 40 percent gravel
Depth to restrictive feature: 20 to 40 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 4.8 inches (low)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: C
Calcium carbonate maximum: About 70 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp. wyomingensis-ephe-dra viridis/Poa fendleriana
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XF627AZ
Present vegetation: muttongrass, Indian ricegrass, Wyoming big sagebrush, bottlebrush squirreltail, green Mormon tea, Stansbury cliffrose, blue grama, prairie junegrass, true mountainmahogany
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; very gravelly sandy loam
Bk1—2 to 8 inches; sandy loam
Bk2—8 to 19 inches; loam
Bk3—19 to 31 inches; loam
R—31 to 41 inches; bedrock

Nizhoni family soils

Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthents
Landform: Structural bench escarpments on plateaus
Parent material: Eolian deposits and residuum weathered from sandstone
Slope: 15 to 30 percent
Depth to restrictive feature: 10 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 1.7 inches (very low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp.
wyomingensis-ephrada viridis/Poa fendleriana
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XF627AZ
Present vegetation: muttongrass, Indian ricegrass, bottlebrush squirreltail, green Mormon tea, Stansbury cliffrose, Wyoming big sagebrush, blue grama, prairie junegrass, true mountainmahogany
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 3 inches; fine sandy loam
C—3 to 12 inches; fine sandy loam
R—12 to 22 inches; bedrock

Rock outcrop
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

5—Bacobi fine sandy loam, 1 to 5 percent slopes

Map Unit Setting
Landform setting: mesas
Elevation: 4,800 to 5,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition
Bacobi and similar soils: 80 percent
Minor components: 20 percent
• Norkiki family

Component Descriptions

Bacobi soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Typic Haplargids
Landform: Summits of mesas
Parent material: Fan alluvium and/or eolian deposits derived from sandstone and shale

Slope: 1 to 5 percent
Depth to restrictive feature: 20 to 39 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 5.4 inches (low)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: C
Calcium carbonate maximum: About 15 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 10 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Loamy Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB210AZ
Present vegetation: alkali sacaton, galleta, Indian ricegrass, shadscale saltbush, bottlebrush squirreltail, broom snakeweed
Land capability subclass (irrigated): 3e
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 2 inches; fine sandy loam
Bt—2 to 15 inches; very fine sandy loam
Btk1—15 to 26 inches; sandy clay loam
Btk2—26 to 36 inches; fine sandy loam
Cr—36 to 60 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

6—Badland-Claysprings family complex, 3 to 60 percent slopes

Map Unit Setting

Landform setting: escarpments
Elevation: 5,400 to 6,200 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Badland: 60 percent
Claysprings family and similar soils: 30 percent
Minor components: 10 percent
• Jociity, occasionally flooded, Loamy Bottom 6-10" p.z.
• Riverwash, frequently flooded
• Somorent family, Shale Upland 6-10" p.z.
Component Descriptions

Badland
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.

Claysprings family soils
Taxonomic Classification: Clayey, smectitic, calcareous, mesic, shallow Typic Torriorthents
Landform: Escarpments
Parent material: Residuum weathered from shale
Slope: 3 to 60 percent
Depth to restrictive feature: 6 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 2.2 inches (very low)
Shrink-swell potential: About 7.0 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: About 2 percent
Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 5 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Mudstone/Sandstone Hills 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB201AZ
Present vegetation: galleta, Bigelow sagebrush, Indian ricegrass, Mormon tea, alkali sacaton, blue grama, buckwheat, shadscale saltbush
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 2 inches; gravelly clay loam
C—2 to 11 inches; clay loam
Cr—11 to 60 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

7—Badland-Hanksville complex, 35 to 60 percent slopes

Map Unit Setting

Landform setting: plateaus
Elevation: 5,800 to 6,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days
Map Unit Composition

Badland: 45 percent
Hanksville and similar soils: 40 percent
Minor components: 15 percent
- Rock outcrop
- Farb, Sandstone Upland 5-8" p.z.
- Chipeta family, Breaks 5-8" p.z.

Component Descriptions

Badland
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.

Hanksville soils
Taxonomic Classification: Fine, mixed, superactive, calcareous, mesic Typic Torriorthents
Landform: Plateaus
Parent material: Slope alluvium over residuum derived from shale
Slope: 35 to 60 percent
Surface fragments: About 20 percent channers
Depth to restrictive feature: 20 to 40 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 2.7 inches (very low)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 3 percent
Gypsum maximum: About 5 percent
Salinity maximum: About 16 dS/m (moderately saline)
Sodium adsorption ratio maximum: About 30 (strongly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Shale Hills 6-10" p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB268AZ
Present vegetation: alkali sacaton, shadscale saltbush, galleta, sickle saltbush, Indian ricegrass, mound saltbush, sand dropseed
Land capability subclass (nonirrigated): 7e

Typical Profile:
- A—0 to 3 inches; channery silt loam
- Bw—3 to 9 inches; silty clay loam
- C—9 to 22 inches; silty clay loam
- Cr—22 to 26 inches; bedrock
8—Badland-Torriorthents association, 1 to 30 percent slopes

Map Unit Setting

Landform setting: hills
Elevation: 4,800 to 5,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 53 to 56 degrees F
Frost-free period: 150 to 180 days

Map Unit Composition

Badland: 75 percent
Torriorthents and similar soils: 15 percent
Minor components: 10 percent

Component Descriptions

Badland
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.

Torriorthents soils
Taxonomic Classification: Torriorthents
Landform: Hills
Slope: 1 to 30 percent
Depth to restrictive feature: 5 to 20 inches to bedrock, paralithic
Drainage class: Excessively drained
Shrink-swell potential: About 7.5 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Salinity maximum: About 16 dS/m (moderately saline)
Sodium adsorption ratio maximum: About 13 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Shale Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB220AZ
Land capability subclass (nonirrigated): 7e

Typical Profile:
A—0 to 10 inches; variable
Cr—10 to 60 inches; bedrock
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

9—Barx-Strych-Doakum families complex, 5 to 65 percent slopes

Map Unit Setting

Landform setting: hills
Elevation: 6,000 to 7,000 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Barx family and similar soils: 45 percent
Strych family and similar soils: 25 percent
Doakum family and similar soils: 20 percent
Minor components: 10 percent
• Badland
• Soils that are sodium-affected
• Soils that are fine textured and moderately deep

Component Descriptions

Barx family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Calciargids
Landform: Hills
Parent material: Eolian deposits and fan alluvium derived from sandstone and shale
and/or slope alluvium derived from sandstone and/or fan alluvium and colluvium
derived from sandstone and shale
Slope: 10 to 35 percent
Surface fragments: About 1 percent gravel
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 9.0 inches (high)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: B
Calcium carbonate maximum: About 25 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Cobbly Slopes 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC328AZ
Present vegetation: Indian ricegrass, galleta, New Mexico feathergrass, blue grama,
Utah juniper, Wyoming big sagebrush, black grama, broom snakeweed, Bigelow
sagebrush, Colorado pinyon
Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 2 inches; fine sandy loam
- Bw—2 to 6 inches; fine sandy loam
- Bt—6 to 12 inches; clay loam
- Btk—12 to 16 inches; sandy clay loam
- Bk1—16 to 32 inches; sandy clay loam
- Bk2—32 to 52 inches; sandy clay loam
- Bk3—52 to 60 inches; fine sandy loam

Strych family soils
Taxonomic Classification: Loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcids
Landform: Hills
Parent material: Fan alluvium and colluvium derived from sandstone and shale and/or fan alluvium and colluvium derived from conglomerate
Slope: 35 to 65 percent
Surface fragments: About 40 percent cobbles
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 5.9 inches (low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: B
Calcium carbonate maximum: About 20 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Sedimentary Cliffs 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC302AZ
Present vegetation: muttongrass, Indian ricegrass, New Mexico feathergrass, blue grama, Greene rabbitbrush, Utah juniper, Wyoming big sagebrush, black grama, galleta, Colorado pinyon

Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 6 inches; very cobbly loam
- Btk—6 to 19 inches; very cobbly loam
- Bk—19 to 27 inches; very cobbly fine sandy loam
- C—27 to 60 inches; loamy fine sand

Doakum family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Haplargids
Landform: Hills
Parent material: Eolian deposits and fan alluvium derived from sandstone and shale
Slope: 5 to 15 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 7.2 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Loamy Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC313AZ
Present vegetation: blue grama, galleta, Indian ricegrass, Wyoming big sagebrush, western wheatgrass, Sphaeralcea, fourwing saltbush, needleandthread, sand dropseed
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 7 inches; loamy fine sand
Bw—7 to 12 inches; fine sandy loam
Bt—12 to 17 inches; sandy clay loam
Btk—17 to 24 inches; sandy clay loam
Bk1—24 to 38 inches; fine sandy loam
Bk2—38 to 64 inches; loamy fine sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

10—Begay-Doakum family complex, 2 to 15 percent slopes

Map Unit Setting

Landform setting: fan terraces
Elevation: 6,400 to 7,200 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Begay and similar soils: 50 percent
Doakum family and similar soils: 40 percent
Minor components: 10 percent
• Pinavetes family, Sandy Upland 10-14” p.z.
• Arches, Sandstone Upland 10-14” p.z.

Component Descriptions

Begay soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
Landform: Fan terraces

Parent material: Eolian deposits and fan alluvium derived from sandstone

Slope: 2 to 15 percent

Surface fragments: About 2 percent gravel

Drainage class: Well drained

Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 7.6 inches (moderate)

Shrink-swell potential: About 1.5 percent (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Low

Hydrologic group: B

Calcium carbonate maximum: About 2 percent

Gypsum maximum: About 1 percent

Salinity maximum: About 2 dS/m (nonsaline)

Sodium adsorption ratio maximum: About 2 (slightly sodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands

Ecological site: Sandy Loam Upland 10-14" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XC317AZ

Present vegetation: galleta, blue grama, Wyoming big sagebrush, sand dropseed, Indian ricegrass, Utah juniper, bottlebrush squirreltail, needleandthread, Colorado pinyon, fourwing saltbush, rabbitbrush

Land capability subclass (nonirrigated): 6c

Typical Profile:

A—0 to 2 inches; fine sandy loam

Bw1—2 to 15 inches; fine sandy loam

Bw2—15 to 33 inches; fine sandy loam

C1—33 to 43 inches; fine sandy loam

C2—43 to 46 inches; very gravelly loamy fine sand

C3—46 to 70 inches; loamy fine sand

Doakum family soils

Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Haplargids

Landform: Fan terraces

Parent material: Fan alluvium derived from sandstone and shale

Slope: 2 to 15 percent

Drainage class: Well drained

Slowest permeability: 0.6 to 2.0 in/hr (moderate)

Available water capacity: About 7.5 inches (moderate)

Shrink-swell potential: About 1.5 percent (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Medium

Hydrologic group: C

Calcium carbonate maximum: About 2 percent

Gypsum maximum: None

Salinity maximum: About 2 dS/m (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Loamy Upland 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XC313AZ

Present vegetation: western wheatgrass, Wyoming big sagebrush, blue grama, galleta, Indian ricegrass, bottlebrush squirreltail, fourwing saltbush, Utah juniper, Colorado pinyon

Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 1 inch; fine sandy loam
BA—1 inch to 6 inches; very fine sandy loam
Bt—6 to 16 inches; fine sandy loam
Btk—16 to 30 inches; sandy clay loam
Bk—30 to 47 inches; sandy loam
C—47 to 80 inches; loamy sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

11—Begay-Milok family-Mathis family complex, 1 to 60 percent slopes

Map Unit Setting

Landform setting: fan terraces, hills
Elevation: 6,000 to 6,800 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Begay and similar soils: 40 percent
Milok family and similar soils: 30 percent
Mathis family and similar soils: 20 percent
Minor components: 10 percent
• Begay, Sandy Loam Upland 10-14" p.z.
• Zia, Sandy Loam Upland 10-14" p.z.

Component Descriptions

Begay soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
Landform: Fan terraces
Parent material: Eolian deposits and fan alluvium derived from sandstone
Slope: 1 to 8 percent
Surface fragments: About 1 percent gravel
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 7.1 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 2 percent
Gypsum maximum: About 1 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Sandy Loam Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA117AZ
Present vegetation: blue grama, Indian ricegrass, black grama, galleta, needleandthread, fourwing saltbush, winterfat, Greene rabbitbrush, Utah juniper, Mormon tea
Land capability subclass (nonirrigated): 6c
Typical Profile:
A—0 to 3 inches; sandy loam
Bw—3 to 13 inches; loamy sand
Bk1—13 to 37 inches; fine sandy loam
Bk2—37 to 51 inches; sandy loam
Bk3—51 to 66 inches; sandy loam
C—66 to 80 inches; sandy clay loam

Milok family soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids
Landform: Fan terraces, hills
Parent material: Eolian material and slope alluvium derived from sandstone
Slope: 2 to 8 percent
Surface fragments: About 1 percent gravel
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 7.1 inches (moderate)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 35 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 1 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Sandy Loam Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA117AZ
Present vegetation: blue grama, Indian ricegrass, fourwing saltbush, galleta, black grama, needleandthread, rubber rabbitbrush, Greene rabbitbrush, Mormon tea
Land capability subclass (nonirrigated): 6c
Typical Profile:
A—0 to 2 inches; fine sandy loam
Bw1—2 to 14 inches; sandy loam
Bw2—14 to 26 inches; sandy loam
Bk1—26 to 51 inches; sandy loam
Bk2—51 to 61 inches; sandy loam

**Mathis family soils**

*Taxonomic Classification:* Sandy-skeletal, mixed, mesic Ustic Torriorthents

*Landform:* Hills

*Parent material:* Colluvium derived from sandstone

*Slope:* 8 to 60 percent

*Surface fragments:* About 50 percent channers, about 5 percent flagstones

*Drainage class:* Somewhat excessively drained

*Slowest permeability:* 6.0 to 20 in/hr (rapid)

*Available water capacity:* About 1.5 percent (low)

*Shrink-swell potential:* About 1.5 percent (low)

*Flooding hazard:* None

*Ponding hazard:* None

*Runoff class:* Low

*Hydrologic group:* A

*Calcium carbonate maximum:* About 2 percent

*Gypsum maximum:* None

*Salinity maximum:* About 2 dS/m (nonsaline)

* Sodium adsorption ratio maximum:* About 0 (nonsodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-1AZ; Colorado Plateau Mixed Grass Plains

*Ecological site:* Sandy Slopes 10-14” p.z. Channery

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Ecological site ID:* R035XA103AZ

*Present vegetation:* New Mexico feathergrass, black grama, blue grama, galleta, Bigelow sagebrush, Indian ricegrass, Sporobolus, rubber rabbitbrush, Utah juniper, sandhill muhly

*Land capability subclass (nonirrigated):* 6c

Typical Profile:

- **A**—0 to 4 inches; very channery loamy fine sand
- **C**—4 to 60 inches; very channery loamy fine sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

**12—Begay-Penistaja family complex, 2 to 8 percent slopes**

**Map Unit Setting**

*Landform setting:* fan terraces

*Elevation:* 5,800 to 6,600 feet

*Mean annual precipitation:* 10 to 14 inches

*Mean annual air temperature:* 50 to 53 degrees F

*Frost-free period:* 120 to 150 days

**Map Unit Composition**

Begay and similar soils: 50 percent
Penistaja family and similar soils: 45 percent
Minor components: 5 percent
• Begay, Sandy Loam Upland 10-14" p.z.
• Khapo, Sandy Loam Upland 10-14" p.z.

Component Descriptions

Begay soils
*Taxonomic Classification:* Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
*Landform:* Fan terraces
*Parent material:* Eolian material and fan alluvium derived from sandstone
*Slope:* 3 to 8 percent
*Surface fragments:* About 1 percent gravel
*Drainage class:* Well drained
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)
*Available water capacity:* About 7.2 inches (moderate)
*Shrink-swell potential:* About 2.0 percent (low)
*Flooding hazard:* None
*Ponding hazard:* None
*Runoff class:* Low
*Hydrologic group:* B
*Calcium carbonate maximum:* About 2 percent
*Gypsum maximum:* None
*Salinity maximum:* About 8 dS/m (slightly saline)
*Sodium adsorption ratio maximum:* About 2 (slightly sodic)
*Major Land Resource Area:* 35; Colorado Plateau
*Land Resource Unit:* 35-1AZ; Colorado Plateau Mixed Grass Plains
*Ecological site:* Sandy Loam Upland 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
*Ecological site ID:* R035XA117AZ
*Present vegetation:* blue grama, Indian ricegrass, black grama, galleta, needleandthread, fourwing saltbush, Greene rabbitbrush, winterfat, Utah juniper, banana yucca, Mormon tea
*Land capability subclass (nonirrigated):* 6c

Typical Profile:
A—0 to 2 inches; fine sandy loam
Bw—2 to 8 inches; fine sandy loam
Bk1—8 to 23 inches; sandy loam
Bk2—23 to 46 inches; sandy loam
C1—46 to 63 inches; sandy loam
C2—63 to 80 inches; sandy loam

Penistaja family soils
*Taxonomic Classification:* Fine-loamy, mixed, superactive, mesic Ustic Haplargids
*Landform:* Fan terraces
*Parent material:* Eolian material and fan alluvium derived from sandstone and shale
*Slope:* 2 to 6 percent
*Drainage class:* Well drained
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)
*Available water capacity:* About 7.9 inches (moderate)
*Shrink-swell potential:* About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 1 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Sandy Loam Upland 10-14" p.z.,
Other ecological sites may occur in this map unit and vary in extent between
delineations.
Ecological site ID: R035XA117AZ
Present vegetation: blue grama, Indian ricegrass, black grama, galleta, bottlebrush
squirreltail, fourwing saltbush, winterfat, Utah juniper, banana yucca, Mormon tea
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; fine sandy loam
BA—2 to 12 inches; fine sandy loam
Bt1—12 to 30 inches; fine sandy loam
Bt2—30 to 38 inches; sandy clay loam
Bk1—38 to 44 inches; sandy loam
Bk2—44 to 54 inches; sandy loam
C—54 to 75 inches; sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil
component and its Range in Characteristics.

13—Benally family-Fruitland association, 1 to 5 percent slopes

Map Unit Setting

Landform setting: stream terraces
Elevation: 5,800 to 6,300 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Benally family and similar soils: 50 percent
Fruitland and similar soils: 40 percent
Minor components: 10 percent
• Fajada, Loamy Upland 5-8" p.z. Sodic
• Huerfano, Loamy Upland 5-8" p.z. Sodic

Component Descriptions

Benally family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Typic Natrigypsids
Landform: Stream terraces
**Parent material:** Stream alluvium derived from sandstone and shale

**Slope:** 1 to 5 percent

**Depth to restrictive feature:** 40 to 60 inches to bedrock, paralithic

**Drainage class:** Well drained

**Slowest permeability:** 0.6 to 2.0 in/hr (moderate)

**Available water capacity:** About 6.2 inches (moderate)

**Shrink-swell potential:** About 1.0 percent (low)

**Flooding hazard:** None

**Ponding hazard:** None

**Runoff class:** Low

**Hydrologic group:** B

**Calcium carbonate maximum:** About 5 percent

**Gypsum maximum:** About 5 percent

**Salinity maximum:** About 4 dS/m (very slightly saline)

**Sodium adsorption ratio maximum:** About 30 (strongly sodic)

**Major Land Resource Area:** 35; Colorado Plateau

**Land Resource Unit:** 35-2AZ; Colorado Plateau Shrub-Grasslands

**Ecological site:** Loamy Upland 6-10" p.z. Sodic

Other ecological sites may occur in this map unit and vary in extent between delineations.

**Ecological site ID:** R035XB228AZ

**Present vegetation:** alkali sacaton, galleta, mound saltbush, Indian ricegrass, shadscale saltbush

**Land capability subclass (nonirrigated):** 7c

**Typical Profile:**

A—0 to 1 inch; gravelly fine sandy loam

Bn—1 inch to 4 inches; fine sandy loam

Btkn—4 to 8 inches; sandy clay loam

Bk1—8 to 25 inches; fine sandy loam

Bk2—25 to 44 inches; fine sandy loam

Cr—44 to 60 inches; bedrock

**Fruitland soils**

*Taxonomic Classification:* Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents

**Landform:** Stream terraces

**Parent material:** Eolian and stream alluvium derived from sandstone and shale

**Slope:** 1 to 5 percent

**Drainage class:** Somewhat excessively drained

**Slowest permeability:** 0.6 to 2.0 in/hr (moderate)

**Available water capacity:** About 8.3 inches (moderate)

**Shrink-swell potential:** About 1.0 percent (low)

**Flooding hazard:** None

**Ponding hazard:** None

**Runoff class:** Very low

**Hydrologic group:** B

**Calcium carbonate maximum:** About 5 percent

**Gypsum maximum:** About 1 percent

**Salinity maximum:** About 2 dS/m (nonsaline)

**Sodium adsorption ratio maximum:** About 5 (slightly sodic)

**Major Land Resource Area:** 35; Colorado Plateau

**Land Resource Unit:** 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Upland 6-10” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB217AZ

Present vegetation: Indian ricegrass, Sporobolus, galleta, blue grama, Mormon tea, winterfat, fourwing saltbush

Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 1 inch; loamy fine sand
C1—1 inch to 17 inches; loamy fine sand
C2—17 to 34 inches; fine sandy loam
Ck1—34 to 45 inches; fine sandy loam
Ck2—45 to 50 inches; clay loam
Ck3—50 to 60 inches; silt loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

14—Betonnie-Bond families-Skyvillage complex, 3 to 8 percent slopes

Map Unit Setting

Landform setting: cuestas, plateaus
Elevation: 6,400 to 7,000 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 130 to 150 days

Map Unit Composition

Betonnie family and similar soils: 35 percent
Bond family and similar soils: 30 percent
Skyvillage and similar soils: 25 percent
Minor components: 10 percent
• Rock outcrop
• Betoonie, Sandy Loam Upland 10-14” p.z.
• Doakum family, Loamy Upland 10-14” p.z.

Component Descriptions

Betonnie family soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplargids
Landform: Plateau dipslopes, cuestas
Parent material: Eolian deposits and slope alluvium derived from sandstone and/or eolian deposits and slope alluvium derived from sandstone and shale
Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 3.8 inches (low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 20 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Sandy Loam Upland 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC317AZ
Present vegetation: galleta, blue grama, fourwing saltbush, sand dropseed, bottlebrush squirreltail, Mormon tea, Juniperus
Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 4 inches; loamy fine sand
- Bt—4 to 12 inches; fine sandy loam
- Btk—12 to 36 inches; loamy fine sand
- Ck—36 to 37 inches; fine sandy loam
- R—37 to 47 inches; bedrock

Bond family soils
Taxonomic Classification: Loamy, mixed, superactive, mesic Lithic Ustic Haplargids
Landform: Plateau dipslopes
Parent material: Eolian deposits and slope alluvium derived from sandstone and shale
Slope: 3 to 8 percent
Depth to restrictive feature: 10 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 3.3 inches (low)
Shrink-swell potential: About 7.0 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: High

Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Shallow Loamy 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC319AZ
Present vegetation: New Mexico feathergrass, Wyoming big sagebrush, black grama, galleta, Indian ricegrass, Juniperus, Sporobolus, bottlebrush squirreltail, fourwing saltbush
Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 1 inch; fine sandy loam
- Bw—1 inch to 6 inches; sandy clay loam
- Bt1—6 to 11 inches; clay loam
Bt2—11 to 16 inches; clay loam
Btk—16 to 18 inches; clay loam
R—18 to 28 inches; bedrock

**Skyvillage soils**

*Taxonomic Classification:* Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents

*Landform:* Plateau dipslopes

*Parent material:* Eolian deposits and slope alluvium derived from sandstone

*Slope:* 3 to 8 percent

*Depth to restrictive feature:* 10 to 20 inches to bedrock, lithic

*Drainage class:* Well drained

*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)

*Available water capacity:* About 2.0 inches (very low)

*Shrink-swell potential:* About 1.0 percent (low)

*Flooding hazard:* None

*Ponding hazard:* None

*Runoff class:* High

*Hydrologic group:* D

*Calcium carbonate maximum:* About 20 percent

*Gypsum maximum:* None

*Salinity maximum:* About 4 dS/m (very slightly saline)

*Sodium adsorption ratio maximum:* About 0 (nonsodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-3AZ; Colorado Plateau Sagebrush-Grasslands

*Ecological site:* Juniperus osteosperma/Artemisia bigelovii-Purshia stansburiana/
Achnatherum hymenoides-Hesperostipa neomexicana

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Ecological site ID:* F035XC322AZ

*Present vegetation:*

  - **Common trees:** two needle pinyon, one seed juniper
  - **Other plants:** New Mexico feathergrass, Bigelow sagebrush, Indian ricegrass,
    Greene rabbitbrush, Stansbury cliffrose, blue grama, muttongrass

*Land capability subclass (nonirrigated):* 6c

Typical Profile:

- A—0 to 5 inches; loam
- C—5 to 14 inches; loam
- R—14 to 24 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

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**15—Bettonnie-Pinavetes family complex, 3 to 10 percent slopes**

**Map Unit Setting**

*Landform setting:* dunes, fan terraces

*Elevation:* 6,200 to 6,500 feet

*Mean annual precipitation:* 10 to 14 inches

*Mean annual air temperature:* 50 to 53 degrees F

*Frost-free period:* 120 to 150 days
Map Unit Composition

Betonnie and similar soils: 50 percent
Pinavetes family and similar soils: 30 percent
Minor components: 20 percent
• Zia family, occasionally flooded, Loamy Upland 10-14" p.z.
• Penistaja family, Loamy Upland 10-14" p.z.

Component Descriptions

Betonnie soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplargids
Landform: Fan terraces
Parent material: Eolian deposits and fan alluvium derived from sandstone
Slope: 3 to 6 percent
Drainage class: Somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 8.3 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 10 percent
Gypsum maximum: About 1 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Sandy Loam Upland 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA117AZ
Present vegetation: blue grama, Indian ricegrass, Sporobolus, black grama, fourwing saltbush, galleta, needleandthread, winterfat, Greene rabbitbrush, broom snakeweed, oneseed juniper
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; fine sandy loam
BA—2 to 6 inches; fine sandy loam
Bt—6 to 19 inches; fine sandy loam
Bk1—19 to 38 inches; fine sandy loam
Bk2—38 to 54 inches; fine sandy loam
Bk3—54 to 80 inches; fine sandy loam

Pinavetes family soils
Taxonomic Classification: Mixed, mesic Ustic Torripsamments
Landform: Dunes on fan terraces
Parent material: Eolian deposits derived from sandstone
Slope: 5 to 10 percent
Drainage class: Excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity: About 3.5 inches (low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: A
Calcium carbonate maximum: About 1 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Sandy Upland 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between
delineations.
Ecological site ID: R035XA118AZ
Present vegetation: Indian ricegrass, Mormon tea, needleandthread, black grama,
    blue grama, galleta, sand dropseed, sand sagebrush, sandhill muhly, rabbitbrush,
oneseed juniper
Land capability subclass (nonirrigated): 6c
Typical Profile:
    A—0 to 3 inches; fine sand
    C1—3 to 40 inches; fine sand
    C2—40 to 80 inches; fine sand
See “Soil Series and Their Morphology” for a detailed description of the soil
component and its Range in Characteristics.

16—Bighams very fine sandy loam, 1 to 8 percent slopes

Map Unit Setting

Landform setting: hills
Elevation: 6,300 to 6,700 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Bighams and similar soils: 100 percent
Minor components: 0 percent

Component Descriptions

Bighams soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocalcids
Landform: Hills
Parent material: Eolian deposits over alluvium derived from sandstone and/or eolian
deposits over alluvium derived from mudstone
Slope: 1 to 8 percent
Depth to restrictive feature: 24 to 40 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 5.1 inches (low)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 40 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Sandy Loam Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC317AZ
Present vegetation: needleandthread, Indian ricegrass, blue grama, bottlebrush squirreltail, galleta, Utah juniper, spineless horsebrush, twoneedle pinyon
Land capability subclass (nonirrigated): 6e

Typical Profile:
A—0 to 2 inches; very fine sandy loam
Bw—2 to 17 inches; fine sandy loam
Bk—17 to 35 inches; sandy clay loam
Cr—35 to 60 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

17—Bikeyah-Berland families complex, 1 to 15 percent slopes

Map Unit Setting

Landform setting: plateaus
Elevation: 8,400 to 9,200 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 40 to 43 degrees F
Frost-free period: 80 to 110 days

Map Unit Composition

Bikeyah family and similar soils: 45 percent
Berland family and similar soils: 40 percent
Minor components: 15 percent
• Rock outcrop
• Venable family, ponded,
• Bikeyah family, occasionally flooded, wet meadow
• Akhoni family, ponderosa pine forest

Component Descriptions

Bikeyah family soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, frigid Aquic Haplustolls
Landform: High elevation plateaus
Parent material: Slope alluvium derived from sandstone
Slope: 1 to 15 percent
Drainage class: Somewhat poorly drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 7.6 inches (moderate)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: Occasional
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Meadow 17-25" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XH821AZ
Present vegetation: sedge, Kentucky bluegrass, redtop, rush, timothy, western wheatgrass, Rocky Mountain iris, cinquefoil, western yarrow
Land capability subclass (nonirrigated): 5c
Typical Profile:
  Oi—0 to 1 inch; slightly decomposed plant material
  A—1 inch to 15 inches; loam
  Bw1—15 to 27 inches; fine sandy loam
  Bw2—27 to 39 inches; sandy loam
  Bw3—39 to 52 inches; fine sandy loam
  C—52 to 70 inches; loamy fine sand

Berland family soils
Taxonomic Classification: Loamy, mixed, superactive, frigid Lithic Argiustolls
Landform: High elevation plateaus
Parent material: Slope alluvium derived from sandstone
Slope: 1 to 15 percent
Depth to restrictive feature: 6 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 2.1 inches (very low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Shallow Loamy 17-25" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XH823AZ
Present vegetation: mountain muhly, Arizona fescue, blue grama, rosy pussytoes, Louisiana sagewort, pond waterstarwort, prairie junegrass, silverweed cinquefoil
Land capability subclass (nonirrigated): 5c
**Fort Defiance Area, Arizona and New Mexico**

**Typical Profile:**
- A1—0 to 1 inch; loam
- A2—1 inch to 3 inches; fine sandy loam
- Bt—3 to 11 inches; fine sandy loam
- BC—11 to 15 inches; fine sandy loam
- R—15 to 25 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

**18—Blancot family-Chafin complex, 2 to 6 percent slopes**

**Map Unit Setting**

*Landform setting:* fan terraces  
*Elevation:* 6,500 to 7,500 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Mean annual air temperature:* 50 to 53 degrees F  
*Frost-free period:* 120 to 150 days

**Map Unit Composition**

Blancot family and similar soils: 50 percent  
Chafin and similar soils: 35 percent  
Minor components: 15 percent  
- Zia, Sandy Loam Upland 10-14” p.z.  
- Gish, Salty Bottomland 10-14” p.z.

**Component Descriptions**

**Blancot family soils**  
*Taxonomic Classification:* Fine-loamy, mixed, superactive, mesic Ustic Haplargids  
*Landform:* Fan terraces  
*Parent material:* Fan alluvium derived from sandstone and shale  
*Slope:* 2 to 6 percent  
*Drainage class:* Well drained  
*Slowest permeability:* 0.2 to 0.6 in/hr (moderately slow)  
*Available water capacity:* About 11.0 inches (high)  
*Shrink-swell potential:* About 7.0 percent (high)  
*Flooding hazard:* None  
*Ponding hazard:* None  
*Runoff class:* Medium  
*Hydrologic group:* B  
*Calcium carbonate maximum:* About 5 percent  
*Gypsum maximum:* None  
*Salinity maximum:* About 2 dS/m (nonsaline)  
*Sodium adsorption ratio maximum:* About 2 (slightly sodic)  
*Major Land Resource Area:* 35; Colorado Plateau  
*Land Resource Unit:* 35-3AZ; Colorado Plateau Sagebrush-Grasslands  
*Ecological site:* Loamy Upland 10-14” p.z.  

Other ecological sites may occur in this map unit and vary in extent between delineations.  
*Ecological site ID:* R035XC313AZ  
*Present vegetation:* western wheatgrass, galleta, blue grama, Indian ricegrass, Wyoming big sagebrush, bottlebrush squirreltail, fourwing saltbush, broom snakeweed, sand dropseed, Juniperus
Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 1 inch; loam
- Bw—1 inch to 18 inches; loam
- Bt1—18 to 54 inches; clay loam
- Bt2—54 to 60 inches; clay

Chafin soils

Taxonomic Classification: Fine, mixed, superactive, mesic Ustic Haplargids

Landform: Fan terraces

Parent material: Fan alluvium derived from sandstone and shale

Slope: 2 to 4 percent

Drainage class: Well drained

Slowest permeability: .06 to 0.2 in/hr (slow)

Available water capacity: About 9.8 inches (high)

Shrink-swell potential: About 7.0 percent (high)

Flooding hazard: None

Ponding hazard: None

Runoff class: High

Hydrologic group: C

Calcium carbonate maximum: About 5 percent

Gypsum maximum: None

Salinity maximum: About 2 dS/m (nonsaline)

Sodium adsorption ratio maximum: About 2 (slightly sodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands

Ecological site: Clayey Upland 10-14" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XC306AZ

Present vegetation: blue grama, fourwing saltbush, western wheatgrass, bottlebrush squirreltail, galleta, Indian ricegrass, Wyoming big sagebrush, sand dropseed

Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 1 inch; clay loam
- Bt1—1 inch to 8 inches; clay
- Bt2—8 to 32 inches; clay
- C1—32 to 55 inches; clay loam
- 2C2—55 to 60 inches; loamy sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

19—Brimhall-Benally families-Hanksville association, 0 to 45 percent slopes

Map Unit Setting

Landform setting: erosion remnants, fan terraces, structural benches

Elevation: 5,800 to 6,400 feet

Mean annual precipitation: 6 to 10 inches

Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

**Map Unit Composition**

- Brimhall family and similar soils: 35 percent
- Benally family and similar soils: 30 percent
- Hanksville and similar soils: 20 percent
- Minor components: 15 percent
  - Rock outcrop
  - Fajada, Loamy Upland 5-8" p.z. Sodic
  - Huerfano, Loamy Upland 5-8" p.z. Sodic

**Component Descriptions**

**Brimhall family soils**

*Taxonomic Classification:* Coarse-loamy, mixed, superactive, mesic Typic Calcigypsids

*Landform:* Structural benches

*Parent material:* Eolian material and slope alluvium over residuum weathered from sandstone and shale

*Slope:* 1 to 3 percent

*Depth to restrictive feature:* 40 to 60 inches to bedrock, lithic

*Drainage class:* Well drained

*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)

*Available water capacity:* About 5.4 inches (low)

*Shrink-swell potential:* About 1.0 percent (low)

*Floodling hazard:* None

*Ponding hazard:* None

*Runoff class:* Very low

*Hydrologic group:* B

*Calcium carbonate maximum:* About 10 percent

*Gypsum maximum:* About 10 percent

*Salinity maximum:* About 2 dS/m (nonsaline)

*Sodium adsorption ratio maximum:* About 2 (slightly sodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands

*Ecological site:* Sandy Loam Upland 6-10" p.z. Saline

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Ecological site ID:* R035XB274AZ

*Present vegetation:* alkali sacaton, galleta, Indian ricegrass, shadscale saltbush, bottlebrush squirreltail

*Land capability subclass (nonirrigated):* 7c

Typical Profile:

- A—0 to 2 inches; loamy fine sand
- Bw—2 to 10 inches; fine sandy loam
- Bk—10 to 22 inches; fine sandy loam
- Bky—22 to 41 inches; gravelly fine sandy loam
- R—41 to 51 inches; bedrock

**Benally family soils**

*Taxonomic Classification:* Fine-loamy, mixed, superactive, mesic Typic Natrigypsids

*Landform:* Fan terraces

*Parent material:* Slope alluvium over residuum weathered from sandstone and shale
**Slope:** 0 to 2 percent  
**Depth to restrictive feature:** 40 to 60 inches to bedrock, paralithic  
**Drainage class:** Well drained  
**Slowest permeability:** 0.2 to 0.6 in/hr (moderately slow)  
**Available water capacity:** About 11.1 inches (high)  
**Shrink-swell potential:** About 7.0 percent (high)  
**Flooding hazard:** None  
**Ponding hazard:** None  
**Runoff class:** Medium  
**Hydrologic group:** B  
**Calcium carbonate maximum:** About 2 percent  
**Gypsum maximum:** About 10 percent  
**Salinity maximum:** About 4 dS/m (very slightly saline)  
**Sodium adsorption ratio maximum:** About 20 (moderately sodic)  
**Major Land Resource Area:** 35; Colorado Plateau  
**Land Resource Unit:** 35-2AZ; Colorado Plateau Shrub-Grasslands  
**Ecological site:** Loamy Upland 6-10" p.z. Sodic  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
**Ecological site ID:** R035XB228AZ  
**Present vegetation:** alkali sacaton, mound saltbush, galleta, Indian ricegrass  
**Land capability subclass (nonirrigated):** 7s  
**Typical Profile:**  
- E—0 to 2 inches; sandy clay loam  
- Btkn—2 to 11 inches; clay loam  
- Btkny—11 to 16 inches; clay loam  
- Bkny—16 to 56 inches; clay loam  
- Cr—56 to 60 inches; bedrock  

**Hanksville soils**  
**Taxonomic Classification:** Fine, mixed, superactive, calcareous, mesic Typic Torriorthents  
**Landform:** Erosion remnants  
**Parent material:** Slope alluvium over residuum weathered from sandstone and shale  
**Slope:** 15 to 45 percent  
**Surface fragments:** About 16 percent gravel  
**Depth to restrictive feature:** 20 to 40 inches to bedrock, paralithic  
**Drainage class:** Well drained  
**Slowest permeability:** .06 to 0.2 in/hr (slow)  
**Available water capacity:** About 3.8 inches (low)  
**Shrink-swell potential:** About 7.0 percent (high)  
**Flooding hazard:** None  
**Ponding hazard:** None  
**Runoff class:** Very high  
**Hydrologic group:** C  
**Calcium carbonate maximum:** About 2 percent  
**Gypsum maximum:** About 2 percent  
**Salinity maximum:** About 8 dS/m (slightly saline)  
**Sodium adsorption ratio maximum:** About 20 (moderately sodic)  
**Major Land Resource Area:** 35; Colorado Plateau  
**Land Resource Unit:** 35-2AZ; Colorado Plateau Shrub-Grasslands  
**Ecological site:** Shale Hills 6-10" p.z. Sodic  
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB268AZ
Present vegetation: alkali sacaton, shadscale saltbush, galleta, sickle saltbush, Indian ricegrass, bottlebrush squirreltail, mound saltbush, sand dropseed
Land capability subclass (nonirrigated): 7c

Typical Profile:
- A—0 to 2 inches; gravelly clay loam
- Bk—2 to 8 inches; clay loam
- Ck—8 to 16 inches; clay
- Cky—16 to 21 inches; clay loam
- Cr—21 to 60 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

20—Burnswick sandy clay loam, 1 to 5 percent slopes

Map Unit Setting

Landform setting: fan terraces
Elevation: 4,800 to 5,700 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Burnswick and similar soils: 75 percent
Minor components: 25 percent
- Jocity, occasionally flooded, Loamy Bottom 6-10" p.z.
- Badland
- Marcou family, Sandy Loam Upland 6-10" p.z.
- Claysprings family, Shale Upland 6-10" p.z.

Component Descriptions

Burnswick soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Sodic Haplocambids
Landform: Fan terraces
Parent material: Fan alluvium derived from sandstone and shale
Slope: 1 to 5 percent
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 7.9 inches (moderate)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 15 percent
Gypsum maximum: None
Salinity maximum: About 8 dS/m (slightly saline)
Sodium adsorption ratio maximum: About 30 (strongly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Clay Loam Terrace 6-10” p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB237AZ

Present vegetation: alkali sacaton, mound saltbush, galleta, shadscale saltbush, blue grama

Land capability subclass (irrigated): 4s
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 3 inches; sandy clay loam
Bw—3 to 16 inches; sandy clay loam
Bkn—16 to 41 inches; sandy clay loam
Bn—41 to 53 inches; sandy loam
2Bkn—53 to 60 inches; sandy clay loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

21—Burnswick-Marcou family complex, 1 to 5 percent slopes

Map Unit Setting

Landform setting: dunes, fan terraces
Elevation: 4,800 to 5,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 150 days

Map Unit Composition

Burnswick and similar soils: 40 percent
Marcou family and similar soils: 30 percent
Minor components: 30 percent

Component Descriptions

Burnswick soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Sodic Haplocambids
Landform: Fan terraces
Parent material: Eolian material and fan alluvium derived from mudstone and/or eolian material and fan alluvium derived from sandstone and shale
Slope: 1 to 5 percent
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 3.4 inches (low)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 15 percent
Gypsum maximum: None
Salinity maximum: About 8 dS/m (slightly saline)
Sodium adsorption ratio maximum: About 30 (strongly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Clay Loam Terrace 6-10” p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB237AZ
Land capability subclass (nonirrigated): 7s

Typical Profile:
- A—0 to 3 inches; sandy clay loam
- Bw—3 to 16 inches; sandy clay loam
- Bkn—16 to 41 inches; sandy clay loam
- Bn—41 to 53 inches; sandy loam
- 2Bknb—53 to 60 inches; sandy clay loam

Marcou family soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents
Landform: Dunes on fan terraces
Parent material: Eolian material and fan alluvium derived from sandstone
Slope: 1 to 5 percent
Drainage class: Moderately well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 5.5 inches (low)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 20 percent
Gypsum maximum: None
Salinity maximum: About 8 dS/m (slightly saline)
Sodium adsorption ratio maximum: About 30 (strongly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Upland 6-10” p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB223AZ
Land capability subclass (nonirrigated): 7e

Typical Profile:
- A—0 to 6 inches; loamy sand
- C1—6 to 47 inches; sandy loam
- C2—47 to 54 inches; sandy clay loam
- C3—54 to 60 inches; loamy coarse sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
22—Chipeta family-Badland-Moncisco complex, 2 to 45 percent slopes

Map Unit Setting

Landform setting: escarpments, hills
Elevation: 5,800 to 6,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Chipeta family and similar soils: 40 percent
Badland: 25 percent
Moncisco and similar soils: 20 percent
Minor components: 15 percent
• Rock outcrop
• Farb, Sandstone Upland 5-8” p.z.
• Huerfano, Loamy Upland 5-8” p.z. Sodic

Component Descriptions

Chipeta family soils
Taxonomic Classification: Clayey, mixed, active, calcareous, mesic, shallow Typic Torriorthents
Landform: Escarpments, hills
Parent material: Slope alluvium over residuum weathered from shale
Slope: 2 to 35 percent
Surface fragments: About 25 percent channers
Depth to restrictive feature: 5 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 1.3 inches (very low)
Shrink-swell potential: About 7.5 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 10 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Shale Hills 6-10” p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB268AZ
Present vegetation: alkali sacaton, shadscale saltbush, galleta, sickle saltbush, Indian ricegrass, mound saltbush, sand dropseed
Land capability subclass (nonirrigated): 7s

Typical Profile:
A—0 to 2 inches; channery loam
C—2 to 9 inches; clay
Cr—9 to 60 inches; bedrock

**Badland**

Flooding hazard: None  
Ponding hazard: None  
Major Land Resource Area: 35; Colorado Plateau  
Other ecological sites may occur in this map unit and vary in extent between delineations.

**Moncisco soils**

Description: This soil is a taxadjunct to the official series. It does not have a calcic horizon. Use and management are not affected.

*Taxonomic Classification:* Loamy-skeletal over fragmental, mixed, superactive, calcareous, mesic Typic Torriorthents  
*Landform:* Hills  
*Parent material:* Slope alluvium over residuum weathered from shale  
*Slope:* 2 to 45 percent  
*Surface fragments:* About 60 percent gravel, about 25 percent cobbles  
*Depth to restrictive feature:* 8 to 11 inches to strongly contrasting textural stratification  
*Drainage class:* Somewhat excessively drained  
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)  
*Available water capacity:* About 1.3 inches (very low)  
*Shrink-swell potential:* About 0.0 percent (low)  
*Flooding hazard:* None  
*Ponding hazard:* None  
*Runoff class:* Very high  
*Hydrologic group:* D  
*Calcium carbonate maximum:* About 5 percent  
*Gypsum maximum:* About 1 percent  
*Salinity maximum:* About 2 dS/m (nonsaline)  
*Sodium adsorption ratio maximum:* About 10 (slightly sodic)  
*Major Land Resource Area:* 35; Colorado Plateau  
*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands  
*Ecological site:* Porcelanite Hills 6-10" p.z.  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
*Ecological site ID:* R035XB270AZ  
*Present vegetation:* alkali sacaton, shadscale saltbush, Indian ricegrass, galleta, bottlebrush squirreltail, mound saltbush, winterfat  
*Land capability subclass (nonirrigated):* 7s  

Typical Profile:  
A—0 to 2 inches; extremely gravelly fine sandy loam  
C1—2 to 10 inches; very channery fine sandy loam  
C2—10 to 60 inches; fragmental material  

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

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**23—Claysprings family, 1 to 10 percent slopes**

**Map Unit Setting**

*Landform setting:* hills  
*Elevation:* 4,800 to 5,500 feet  
*Mean annual precipitation:* 6 to 10 inches
Mean annual air temperature: 53 to 56 degrees F
Frost-free period: 150 to 180 days

Map Unit Composition

Claysprings family and similar soils: 75 percent
Minor components: 25 percent

Component Descriptions

Claysprings family soils
Taxonomic Classification: Clayey, smectitic, calcareous, mesic, shallow Typic Torriorthents
Landform: Hills
Parent material: Residuum weathered from shale
Slope: 1 to 10 percent
Depth to restrictive feature: 6 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.0 to .001 in/hr (impermeable)
Available water capacity: About 2.7 inches (very low)
Shrink-swell potential: About 7.5 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 16 dS/m (moderately saline)
Sodium adsorption ratio maximum: About 13 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Shale Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB220AZ
Land capability subclass (nonirrigated): 7s

Typical Profile:
A—0 to 3 inches; clay
C—3 to 18 inches; clay
Cr—18 to 28 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

24—Claysprings-Somorent families complex, 1 to 4 percent slopes

Map Unit Setting

Landform setting: hills
Elevation: 5,400 to 6,200 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days
Map Unit Composition

Claysprings family and similar soils: 60 percent
Somorent family and similar soils: 25 percent
Minor components: 15 percent
• Riverwash, frequently flooded
• Jocities, occasionally flooded, Loamy Bottom 6-10” p.z.

Component Descriptions

Claysprings family soils
Taxonomic Classification: Clayey, smectitic, calcareous, mesic, shallow Typic Torriorthents
Landform: Hills
Parent material: Residuum weathered from shale
Slope: 2 to 4 percent
Depth to restrictive feature: 6 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity: About 1.2 inches (very low)
Shrink-swell potential: About 8.0 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: About 2 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Shale Upland 6-10” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB220AZ
Present vegetation: alkali sacaton, galleta, shadscale saltbush, Indian ricegrass, bottlebrush squirreltail, Greene rabbitbrush, broom snakeweed
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 2 inches; clay loam
C—2 to 7 inches; clay
Cr—7 to 60 inches; bedrock

Somorent family soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic, shallow Typic Torriorthents
Landform: Hills
Parent material: Residuum weathered from shale
Slope: 1 to 4 percent
Surface fragments: About 1 percent gravel
Depth to restrictive feature: 5 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 2.8 inches (very low)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 2 percent
Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Shale Upland 6-10” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB220AZ
Present vegetation: alkali sacaton, galleta, shadscale saltbush, Indian ricegrass, bottlebrush squirreltail, Greene rabbitbrush, broom snakeweed
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 2 inches; fine sandy loam
Bw—2 to 5 inches; sandy clay loam
C1—5 to 16 inches; sandy clay loam
C2—16 to 18 inches; clay loam
2Cr—18 to 60 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

25—Doakum fine sandy loam, 2 to 8 percent slopes

Map Unit Setting

Landform setting: drainageways, fan terraces
Elevation: 6,100 to 7,200 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Doakum and similar soils: 85 percent
Minor components: 15 percent
• Gapmesa, Loamy Upland 10-14” p.z.
• Zia, Sandy Loam Upland 10-14” p.z.

Component Descriptions

Doakum soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Hapludults
Landform: Fan terraces, drainageways
Parent material: Fan alluvium derived from sandstone and shale
Slope: 2 to 8 percent
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 10.7 inches (high)
Shrink-swelling potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 1 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Loamy Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC313AZ
Present vegetation: western wheatgrass, Wyoming big sagebrush, blue grama, galleta, Indian ricegrass, bottlebrush squirreltail, sand dropseed, Colorado pinyon, Utah juniper, broom snakeweeds
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; fine sandy loam
Bt1—2 to 10 inches; clay loam
Bt2—10 to 25 inches; clay loam
Bk1—25 to 40 inches; loam
Bk2—40 to 70 inches; loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

26—Doakum-Gapmesa-Bond complex, 1 to 6 percent slopes

Map Unit Setting
Landform setting: fan terraces, mesas
Elevation: 6,100 to 6,800 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition
Doakum and similar soils: 35 percent
Gapmesa and similar soils: 30 percent
Bond and similar soils: 25 percent
Minor components: 10 percent
• Rock outcrop
• Betonnie, Sandy Loam Upland 10-14” p.z.

Component Descriptions
Doakum soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Haplargids
Landform: Fan terraces
Parent material: Slope alluvium derived from sandstone and shale
**Slope:** 1 to 6 percent  
**Drainage class:** Well drained  
**Slowest permeability:** 0.6 to 2.0 in/hr (moderate)  
**Available water capacity:** About 9.7 inches (high)  
**Shrink-swell potential:** About 4.5 percent (moderate)  
**Flooding hazard:** None  
**Ponding hazard:** None  
**Runoff class:** Low  
**Hydrologic group:** B  
**Calcium carbonate maximum:** About 5 percent  
**Gypsum maximum:** About 1 percent  
**Salinity maximum:** About 2 dS/m (nonsaline)  
**Sodium adsorption ratio maximum:** About 0 (nonsodic)  
**Major Land Resource Area:** 35; Colorado Plateau  
**Land Resource Unit:** 35-3AZ; Colorado Plateau Sagebrush-Grasslands  
**Ecological site:** Loamy Upland 10-14” p.z.  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
**Ecological site ID:** R035XC313AZ  
**Present vegetation:** western wheatgrass, blue grama, galleta, Wyoming big sagebrush, Indian ricegrass, bottlebrush squirreltail, Utah juniper, sand dropseed, Colorado pinyon, broom snakeweed  
**Land capability subclass (nonirrigated):** 6c  
**Typical Profile:**  
A—0 to 2 inches; fine sandy loam  
Bt1—2 to 6 inches; loam  
Bt2—6 to 15 inches; loam  
Btk—15 to 30 inches; loam  
Bk1—30 to 45 inches; loam  
Bk2—45 to 70 inches; sandy clay loam  

**Gapmesa soils**  
**Taxonomic Classification:** Fine-loamy, mixed, superactive, mesic Ustic Haplargids  
**Landform:** Summits of mesas  
**Parent material:** Eolian material and slope alluvium derived from sandstone  
**Slope:** 1 to 6 percent  
**Depth to restrictive feature:** 20 to 40 inches to bedrock, lithic  
**Drainage class:** Well drained  
**Slowest permeability:** 0.6 to 2.0 in/hr (moderate)  
**Available water capacity:** About 4.3 inches (low)  
**Shrink-swell potential:** About 4.5 percent (moderate)  
**Flooding hazard:** None  
**Ponding hazard:** None  
**Runoff class:** Medium  
**Hydrologic group:** C  
**Calcium carbonate maximum:** About 5 percent  
**Gypsum maximum:** None  
**Salinity maximum:** About 2 dS/m (nonsaline)  
**Sodium adsorption ratio maximum:** About 0 (nonsodic)  
**Major Land Resource Area:** 35; Colorado Plateau  
**Land Resource Unit:** 35-3AZ; Colorado Plateau Sagebrush-Grasslands  
**Ecological site:** Loamy Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XC313AZ

Present vegetation: western wheatgrass, blue grama, galleta, Wyoming big sagebrush, Indian ricegrass, Sporobolus, fourwing saltbush, rabbitbrush, Utah juniper, Colorado pinyon, broom snakeweed

Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 2 inches; fine sandy loam
- Bt—2 to 7 inches; loam
- Btk—7 to 22 inches; sandy clay loam
- Bk—22 to 28 inches; sandy clay loam
- R—28 to 38 inches; bedrock

Bond soils

Taxonomic Classification: Loamy, mixed, superactive, mesic Lithic Ustic Haplargids

Landform: Summits of mesas

Parent material: Eolian material and slope alluvium derived from sandstone

Slope: 1 to 6 percent

Depth to restrictive feature: 10 to 20 inches to bedrock, lithic

Drainage class: Well drained

Slowest permeability: 0.6 to 2.0 in/hr (moderate)

Available water capacity: About 2.9 inches (very low)

Shrink-swell potential: About 4.5 percent (moderate)

Flooding hazard: None

Ponding hazard: None

Runoff class: High

Hydrologic group: D

Calcium carbonate maximum: About 10 percent

Gypsum maximum: None

Salinity maximum: About 2 dS/m (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands

Ecological site: Shallow Loamy 10-14” p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XC319AZ

Present vegetation: blue grama, Wyoming big sagebrush, galleta, western wheatgrass, Indian ricegrass, fourwing saltbush, needleandthread, Utah juniper, sand dropseed, Colorado pinyon

Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 1 inch; fine sandy loam
- Bt1—1 inch to 4 inches; sandy clay loam
- Bt2—4 to 12 inches; sandy clay loam
- Bt3—12 to 16 inches; sandy clay loam
- Btk—16 to 20 inches; sandy clay loam
- R—20 to 30 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
27—Doakum family-Betonnie complex, 1 to 8 percent slopes

Map Unit Setting

Landform setting: fan terraces
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Doakum family and similar soils: 45 percent
Betonnie and similar soils: 35 percent
Minor components: 20 percent
• Rock outcrop
• Skyvillage, Breaks 10-14” p.z.
• Nahodish, Salty Bottomland 10-14” p.z.

Component Descriptions

Doakum family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Haplargids
Landform: Fan terraces
Parent material: Eolian deposits and fan alluvium derived from sandstone and/or
    eolian deposits and fan alluvium derived from sandstone and shale
Slope: 1 to 8 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.8 inches (moderate)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Loamy Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between
delineations.
Ecological site ID: R035XC313AZ
Present vegetation: western wheatgrass, blue grama, fourwing saltbush, galleta,
    Indian ricegrass, Wyoming big sagebrush, sand dropseed
Land capability subclass (nonirrigated): 6c

Typical Profile:
    A—0 to 2 inches; fine sandy loam
    Bt—2 to 10 inches; sandy clay loam
    Bt—10 to 23 inches; sandy clay loam
    Btk—23 to 41 inches; sandy clay loam
    Bk—41 to 61 inches; sandy clay loam
C—61 to 80 inches; sandy loam

**Bettonnie soils**

*Taxonomic Classification:* Coarse-loamy, mixed, superactive, mesic Ustic Haplalgids  
*Landform:* Fan terraces  
*Parent material:* Eolian deposits derived from calcareous sandstone and/or slope alluvium derived from calcareous sandstone  
*Slope:* 1 to 8 percent  
*Drainage class:* Well drained  
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)  
*Available water capacity:* About 8.3 inches (moderate)  
*Shrink-swell potential:* About 1.0 percent (low)  
*Flooding hazard:* None  
*Ponding hazard:* None  
*Runoff class:* Very low  
*Hydrologic group:* B  
*Calcium carbonate maximum:* About 2 percent  
*Gypsum maximum:* None  
*Salinity maximum:* About 2 dS/m (nonsaline)  
*Sodium adsorption ratio maximum:* About 10 (slightly sodic)  
*Major Land Resource Area:* 35; Colorado Plateau  
*Land Resource Unit:* 35-3AZ; Colorado Plateau Sagebrush-Grasslands  
*Ecological site:* Sandy Loam Upland 10-14” p.z.  
*Ecological site ID:* R035XC317AZ

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Present vegetation:* galleta, blue grama, fourwing saltbush, sand dropseed, bottlebrush squirreltail, winterfat, Wyoming big sagebrush  
*Land capability subclass (nonirrigated):* 6c

**Typical Profile:**  
A—0 to 2 inches; fine sandy loam  
BA—2 to 7 inches; fine sandy loam  
Bt1—7 to 18 inches; fine sandy loam  
Bt2—18 to 32 inches; fine sandy loam  
C1—32 to 42 inches; fine sandy loam  
C2—42 to 80 inches; fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

**28—Doakum-Bettonnie families complex, 1 to 5 percent slopes**

**Map Unit Setting**

*Landform setting:* cuestas, fan terraces, hills, plateaus  
*Elevation:* 6,300 to 7,000 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Mean annual air temperature:* 50 to 52 degrees F  
*Frost-free period:* 130 to 150 days

**Map Unit Composition**

Doakum family and similar soils: 45 percent  
Bettonnie family and similar soils: 35 percent
Minor components: 20 percent
• Skyvillage, Shallow Loamy 10-14” p.z.
• Bond family, Shallow Loamy 10-14” p.z.

Component Descriptions

Doakum family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Haplargids
Landform: Fan terraces on plateau dipslope
Parent material: Eolian deposits and fan alluvium derived from sandstone and shale
Slope: 1 to 5 percent
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 10.6 inches (high)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Loamy Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC313AZ
Present vegetation: western wheatgrass, blue grama, galleta, Indian ricegrass, fourwing saltbush, Wyoming big sagebrush, broom snakeweed, Juniperus
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 3 inches; loam
Bt1—3 to 9 inches; clay loam
Bt2—9 to 12 inches; clay loam
Btk—12 to 21 inches; clay loam
Bk—21 to 32 inches; loam
C1—32 to 56 inches; loam
C2—56 to 80 inches; loam

Bettonnie family soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplargids
Landform: Dipslope cuestas, hills
Parent material: Eolian deposits
Slope: 1 to 5 percent
Depth to restrictive feature: 20 to 40 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 4.6 inches (low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 20 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Sandy Loam Upland 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC317AZ
Present vegetation: galleta, blue grama, fourwing saltbush, sand dropseed, broom snakeweed, Mormon tea, Juniperus
Land capability subclass (nonirrigated): 6c
Typical Profile:
A—0 to 8 inches; loamy fine sand
Bt—8 to 19 inches; fine sandy loam
Btk—19 to 36 inches; fine sandy loam
R—36 to 46 inches; bedrock
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

29—Dune Land

Map Unit Setting

Landform setting: dunes

Map Unit Composition

Dune land: 100 percent
Minor components: 0 percent

Component Descriptions

Dune land
Parent material: Sandy eolian sands derived from sandstone
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

30—Eagleeye-Teesto family-Rock outcrop complex, 2 to 35 percent slopes

Map Unit Setting

Landform setting: hills
Elevation: 6,400 to 7,000 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F  
Frost-free period: 120 to 150 days

**Map Unit Composition**

Eagleye and similar soils: 40 percent  
Teesto family and similar soils: 30 percent  
Rock outcrop: 20 percent  
Minor components: 10 percent  
- Badland  
- Skyvillage, Shallow Loamy 10-14” p.z.

**Component Descriptions**

**Eagleye soils**

*Taxonomic Classification:* Clayey, mixed, active, nonacid, mesic, shallow Ustic Torriorthents  
*Landform:* Hills  
*Parent material:* Colluvium and residuum weathered from sandstone and shale  
*Slope:* 2 to 35 percent  
*Surface fragments:* About 40 percent gravel, about 10 percent cobbles  
*Depth to restrictive feature:* 6 to 10 inches to bedrock, paralithic  
*Drainage class:* Well drained  
*Slowest permeability:* 0.06 to 0.2 in/hr (slow)  
*Available water capacity:* About 0.8 inches (very low)  
*Shrink-swell potential:* About 7.5 percent (high)  
*Flooding hazard:* None  
*Ponding hazard:* None  
*Runoff class:* Very high  
*Hydrologic group:* D  
*Calcium carbonate maximum:* None  
*Gypsum maximum:* About 5 percent  
*Salinity maximum:* About 4 dS/m (very slightly saline)  
*Sodium adsorption ratio maximum:* About 10 (slightly sodic)  
*Major Land Resource Area:* 35; Colorado Plateau  
*Land Resource Unit:* 35-3AZ; Colorado Plateau Sagebrush-Grasslands  
*Ecological site:* Shale Hills 10-14” p.z.  
*Ecological site ID:* R035XC320AZ  
*Present vegetation:* galleta, Indian ricegrass, alkali sacaton, shadscale saltbush,  
  - Colorado pinyon, Utah juniper, bottlebrush squirreltail, sagebrush, broom  
  - snakeweed, rabbitbrush  
*Land capability subclass (nonirrigated):* 7e

**Typical Profile:**
- A—0 to 1 inch; very gravelly clay loam  
- C—1 inch to 6 inches; clay  
- Cr—6 to 60 inches; bedrock

**Teesto family soils**

*Taxonomic Classification:* Loamy-skeletal, mixed, superactive, calcareous, mesic  
*Lithic Ustic Torriorthents*  
*Landform:* Hills  
*Parent material:* Colluvium and residuum weathered from sandstone  
*Slope:* 2 to 20 percent
**Surface fragments:** About 40 percent channers

**Depth to restrictive feature:** 5 to 20 inches to bedrock, lithic

**Drainage class:** Well drained

**Slowest permeability:** 2.0 to 6.0 in/hr (moderately rapid)

**Available water capacity:** About 0.8 inches (very low)

**Shrink-swell potential:** About 1.0 percent (low)

**Flooding hazard:** None

**Ponding hazard:** None

**Runoff class:** Medium

**Hydrologic group:** D

**Calcium carbonate maximum:** About 2 percent

**Gypsum maximum:** None

**Salinity maximum:** About 2 dS/m (nonsaline)

**Sodium adsorption ratio maximum:** About 0 (nonsodic)

**Major Land Resource Area:** 35; Colorado Plateau

**Land Resource Unit:** 35-3AZ; Colorado Plateau Sagebrush-Grasslands

**Ecological site:** Juniperus osteosperma/Purshia stansburiana-Artemisia bigelovii/Pleuraphis jamesii-Achnatherum hymenoides

Other ecological sites may occur in this map unit and vary in extent between delineations.

**Ecological site ID:** F035XC321AZ

**Present vegetation:** galleta, Indian ricegrass, Stansbury cliffrose, blue grama, Eriogonum, Wyoming big sagebrush, bottlebrush squirreltail, muttongrass, Greene rabbitbrush, black sagebrush

**Land capability subclass (nonirrigated):** 7e

**Typical Profile:**

A—0 to 2 inches; very channery fine sandy loam

C—2 to 9 inches; very channery fine sandy loam

R—9 to 19 inches; bedrock

**Rock outcrop**

**Flooding hazard:** None

**Ponding hazard:** None

**Major Land Resource Area:** 35; Colorado Plateau

Other ecological sites may occur in this map unit and vary in extent between delineations.

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

### 31—Evpark-Arabrab complex, 2 to 6 percent slopes

**Map Unit Setting**

**Landform setting:** mesas, plateaus

**Elevation:** 7,100 to 7,400 feet

**Mean annual precipitation:** 14 to 18 inches

**Mean annual air temperature:** 48 to 51 degrees F

**Frost-free period:** 110 to 140 days

**Map Unit Composition**

Evpark and similar soils: 45 percent

Arabrab and similar soils: 40 percent
Minor components: 15 percent
• Parkelei family, Sandy Loam Upland 13-17” p.z.

**Component Descriptions**

**Evpark soils**

*Taxonomic Classification:* Fine-loamy, mixed, superactive, mesic Aridic Haplustalfs

*Landform:* Summits of plateaus and mesas

*Parent material:* Eolian deposits and slope alluvium derived from sandstone and shale

*Slope:* 2 to 6 percent

*Depth to restrictive feature:* 20 to 40 inches to bedrock, lithic

*Drainage class:* Well drained

*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)

*Available water capacity:* About 4.4 inches (low)

*Shrink-swell potential:* About 4.0 percent (moderate)

*Flooding hazard:* None

*Ponding hazard:* None

*Runoff class:* Low

*Hydrologic group:* C

*Calcium carbonate maximum:* About 2 percent

*Gypsum maximum:* None

*Salinity maximum:* About 2 dS/m (nonsaline)

*Sodium adsorption ratio maximum:* About 0 (nonsodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush

*Ecological site:* Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp. wyomingensis-ephedra viridis/Poa fendleriana

*Other ecological sites may occur in this map unit and vary in extent between delineations.*

*Ecological site ID:* F035XF627AZ

*Present vegetation:*

- **Common trees:** oneseed juniper, twoneedle pinyon
- **Other plants:** muttongrass, Indian ricegrass, Wyoming big sagebrush, blue grama, bottlebrush squirreltail, broom snakeweed, prairie junegrass, redroot buckwheat, pingue rubberweed

*Land capability subclass (nonirrigated):* 6c

*Typical Profile:*

- **A**—0 to 4 inches; fine sandy loam
- **BA**—4 to 7 inches; sandy clay loam
- **Bt1**—7 to 15 inches; sandy clay loam
- **Bt2**—15 to 20 inches; sandy clay loam
- **Bt3**—20 to 30 inches; sandy clay loam
- **R**—30 to 40 inches; bedrock

**Arabrab soils**

*Taxonomic Classification:* Loamy, mixed, superactive, mesic Lithic Haplustalfs

*Landform:* Summits of mesas and plateaus

*Parent material:* Eolian material and slope alluvium derived from sandstone and shale

*Slope:* 2 to 6 percent

*Depth to restrictive feature:* 5 to 20 inches to bedrock, lithic

*Drainage class:* Well drained

*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)

*Available water capacity:* About 1.2 inches (very low)

*Shrink-swell potential:* About 4.0 percent (moderate)
Fort Defiance Area, Arizona and New Mexico

Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Pinus edulis/Artemisia nova/Poa fendleriana
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XF630AZ
Present vegetation:
  Common trees: oneseed juniper, twoneedle pinyon
  Other plants: muttongrass, Wyoming big sagebrush, blue grama, Eriogonum, Utah serviceberry, bottlebrush squirreltail, Gambel oak, pingue rubberweed
Land capability subclass (nonirrigated): 6c

Typical Profile:
  A—0 to 3 inches; loam
  Bt—3 to 8 inches; sandy clay loam
  R—8 to 18 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

32—Evpark-Vessilla-Arabrab complex, 1 to 25 percent slopes

Map Unit Setting

Landform setting: hills, mesas, plateaus
Elevation: 6,300 to 7,800 feet
Mean annual precipitation: 14 to 18 inches
Mean annual air temperature: 48 to 51 degrees F
Frost-free period: 110 to 140 days

Map Unit Composition

Evpark and similar soils: 40 percent
Vessilla and similar soils: 25 percent
Arabrab and similar soils: 20 percent
Minor components: 15 percent
  • Rock outcrop on escarpments
  • Fraguni, pinyon-juniper forestland
  • Parkelei family, pinyon-juniper forestland

Component Descriptions

Evpark soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Aridic Haplustalfs
Landform: Summits of mesas and plateaus
Parent material: Eolian deposits and slope alluvium derived from sandstone and shale
Slope: 1 to 5 percent
Depth to restrictive feature: 20 to 40 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 5.3 inches (low)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: C
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp. wyomingensis-ephedra viridis/Poa fendleriana
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XF627AZ
Present vegetation:
  Common trees: oneseed juniper, twoneedle pinyon
  Other plants: Wyoming big sagebrush, muttongrass, Indian ricegrass, blue grama, bottlebrush squirreltail, prairie junegrass, redroot buckwheat, broom snakeweed
Land capability subclass (nonirrigated): 6c

Typical Profile:
  A—0 to 3 inches; fine sandy loam
  Bt1—3 to 11 inches; sandy clay loam
  Bt2—11 to 23 inches; sandy clay loam
  Btk1—23 to 32 inches; sandy clay loam
  Btk2—32 to 36 inches; sandy clay loam
  2R—36 to 46 inches; bedrock

Vessilla soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthents
Landform: Hills
Parent material: Slope alluvium derived from sandstone
Slope: 5 to 25 percent
Surface fragments: About 15 percent gravel
Depth to restrictive feature: 10 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 1.6 inches (very low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp. wyomingensis-ephedra viridis/Poa fendleriana
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XF627AZ
Present vegetation:
  Common trees: oneseed juniper, twoneedle pinyon
  Other plants: muttongrass, Indian ricegrass, Stansbury cliffrose, Wyoming big sagebrush, blue grama, bottlebrush squirreltail, broom snakeweed, prairie junegrass
Land capability subclass (nonirrigated): 6c
Typical Profile:
  A1—0 to 2 inches; fine sandy loam
  A2—2 to 5 inches; fine sandy loam
  C1—5 to 11 inches; loamy fine sand
  C2—11 to 15 inches; loamy fine sand
  R—15 to 25 inches; bedrock

Arabrab soils
Taxonomic Classification: Loamy, mixed, superactive, mesic Lithic Haplustalfs
Landform: Summits of mesas and plateaus
Parent material: Eolian material and slope alluvium derived from sandstone and shale
Slope: 3 to 8 percent
Surface fragments: About 4 percent gravel
Depth to restrictive feature: 10 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 3.0 inches (low)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Pinus edulis/Artemisia nova/Poa fendleriana
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XF630AZ
Present vegetation:
  Common trees: oneseed juniper, twoneedle pinyon
  Other plants: muttongrass, Wyoming big sagebrush, blue grama, Eriogonum, Utah serviceberry, bottlebrush squirreltail, Gambel oak, Stansbury cliffrose
Land capability subclass (nonirrigated): 6c
Typical Profile:
  A—0 to 3 inches; fine sandy loam
Bt—3 to 11 inches; clay loam
Btk—11 to 16 inches; clay loam
R—16 to 26 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

33—Fajada-Huerfano-Benally family complex, 1 to 5 percent slopes

Map Unit Setting

Landform setting: erosion remnants, fan terraces, plateaus
Elevation: 5,800 to 6,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Huerfano and similar soils: 30 percent
Fajada and similar soils: 30 percent
Benally family and similar soils: 25 percent
Minor components: 15 percent
• Rock outcrop
• Badland

Component Descriptions

Huerfano soils
Taxonomic Classification: Loamy, mixed, superactive, mesic, shallow Typic Natrargids
Landform: Erosion remnants on plateaus
Parent material: Alluvium over residuum weathered from sandstone and shale
Slope: 1 to 5 percent
Depth to restrictive feature: 10 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 1.5 inches (very low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 2 percent
Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 30 (strongly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Loamy Upland 6-10" p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB228AZ
Present vegetation: alkali sacaton, mound saltbush, galleta, Indian ricegrass, shadscale saltbush, blue grama
Land capability subclass (nonirrigated): 7s

Typical Profile:
- A—0 to 2 inches; gravelly fine sandy loam
- Btn—2 to 6 inches; sandy clay loam
- Bk—6 to 11 inches; fine sandy loam
- Cr—11 to 60 inches; bedrock

Fajada soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Typic Natrargids
Landform: Erosion remnants on plateaus
Parent material: Alluvium over residuum weathered from sandstone and shale
Slope: 1 to 5 percent
Depth to restrictive feature: 20 to 40 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 4.1 inches (low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 10 percent
Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 30 (strongly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Loamy Upland 6-10" p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB228AZ
Present vegetation: alkali sacaton, mound saltbush, galleta, Indian ricegrass, shadscale saltbush, blue grama
Land capability subclass (nonirrigated): 7s

Typical Profile:
- A—0 to 2 inches; gravelly fine sandy loam
- Btn—2 to 6 inches; fine sandy loam
- Btkny—6 to 15 inches; clay loam
- BCky—15 to 26 inches; fine sandy loam
- Cr—26 to 60 inches; bedrock

Benally family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Typic Natrigypsids
Landform: Fan terraces on plateaus
Parent material: Slope alluvium over residuum weathered from sandstone and shale
Slope: 1 to 5 percent
Depth to restrictive feature: 40 to 60 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 8.2 inches (moderate)
Shrink-swell potential: About 5.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: C
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 5 percent
Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 30 (strongly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Loamy Upland 6-10" p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB228AZ
Present vegetation: alkali sacaton, mound saltbush, galleta, Indian ricegrass, shadscale saltbush, blue grama
Land capability subclass (nonirrigated): 7s
Typical Profile:
E—0 to 2 inches; clay loam
Btn—2 to 9 inches; clay loam
Btk—9 to 16 inches; clay loam
Bk1—16 to 22 inches; clay loam
Bk2—22 to 41 inches; loam
Cr—41 to 60 inches; bedrock
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

34—Farb-Chipeta family-Rock outcrop complex, 2 to 30 percent slopes

Map Unit Setting

Landform setting: escarpments, mesas
Elevation: 5,800 to 6,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Farb and similar soils: 35 percent
Chipeta family and similar soils: 30 percent
Rock outcrop: 25 percent
Minor components: 10 percent
• Badland

Component Descriptions

Farb soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic Lithic Torriorthents
Landform: Summits of mesas
Parent material: Slope alluvium over residuum weathered from sandstone
Slope: 2 to 30 percent
Surface fragments: About 45 percent gravel
Depth to restrictive feature: 5 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 1.2 inches (very low)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandstone/Shale Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB215AZ
Present vegetation: Indian ricegrass, galleta, Bigelow sagebrush, ephedra, Sporobolus, New Mexico feathergrass, bottlebrush squirreltail, shadscale saltbush
Land capability subclass (nonirrigated): 7s

Typical Profile:
A—0 to 2 inches; very gravelly loam
C—2 to 9 inches; sandy loam
R—9 to 19 inches; bedrock

Chipeta family soils
Taxonomic Classification: Clayey, mixed, active, calcareous, mesic, shallow Typic Torriorthents
Landform: Escarpments
Parent material: Slope alluvium over residuum weathered from shale
Slope: 2 to 30 percent
Surface fragments: About 32 percent gravel
Depth to restrictive feature: 5 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 1.3 inches (very low)
Shrink-swell potential: About 8.0 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: About 10 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Shale Hills 6-10" p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB268AZ
Present vegetation: shadscale saltbush, galleta, sickle saltbush, Indian ricegrass, mound saltbush, alkali sacaton
Land capability subclass (nonirrigated): 7s

Typical Profile:
A—0 to 2 inches; gravelly clay loam
Bw—2 to 8 inches; clay
Cr—8 to 60 inches; bedrock

Rock outcrop
Flooding hazard: None
Ponding hazard: None

Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

35—Flaco-Chinchin family complex, 1 to 8 percent slopes

Map Unit Setting
Landform setting: buttes, mesas
Elevation: 6,000 to 7,300 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition
Flaco and similar soils: 50 percent
Chinchin family and similar soils: 30 percent
Minor components: 20 percent
• Rock outcrop

Component Descriptions
Flaco soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Calciargids
Landform: Summits of buttes and mesas
Parent material: Eolian deposits and slope alluvium derived from volcanic and sedimentary rock
Slope: 1 to 4 percent
Depth to restrictive feature: 20 to 40 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 4.6 inches (low)
Shrink-swell potential: About 5.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: C
Calcium carbonate maximum: About 20 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Sandy Loam Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA117AZ
Present vegetation: blue grama, galleta, Indian ricegrass, black grama, fourwing saltbush, needleandthread, sand dropseed, winterfat, ephedra, Greene rabbitbrush
Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 2 inches; fine sandy loam
- Bt—2 to 10 inches; sandy clay loam
- Btk1—10 to 22 inches; sandy clay loam
- Btk2—22 to 26 inches; sandy clay loam
- Bk—26 to 32 inches; sandy loam
- 2R—32 to 42 inches; bedrock

Chinchin family soils
Taxonomic Classification: Loamy, mixed, superactive, mesic Lithic Calciargids
Landform: Summits of buttes, mesas
Parent material: Eolian material and slope alluvium derived from volcanic rock and/or eolian material and slope alluvium derived from sandstone and shale
Slope: 3 to 8 percent
Depth to restrictive feature: 10 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 2.8 inches (very low)
Shrink-swell potential: About 5.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 25 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Shallow Loamy 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA119AZ
Present vegetation: blue grama, Indian ricegrass, black grama, fourwing saltbush, galleta, Bigelow sagebrush, needleandthread, ephedra, Utah juniper, winterfat
Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 2 inches; very fine sandy loam
- Bt1—2 to 7 inches; loam
- Bt2—7 to 11 inches; sandy clay loam
Btk—11 to 16 inches; sandy clay loam
Bk—16 to 19 inches; gravelly sandy loam
2R—19 to 29 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

36—Gapmesa-Bond family complex, 1 to 8 percent slopes

Map Unit Setting

Landform setting: hills, mesas
Elevation: 6,500 to 7,200 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 120 to 140 days

Map Unit Composition

Gapmesa and similar soils: 50 percent
Bond family and similar soils: 35 percent
Minor components: 15 percent

Component Descriptions

Gapmesa soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Haplargids
Landform: Hills, mesas
Parent material: Eolian material and slope alluvium derived from sandstone and shale
Slope: 1 to 5 percent
Depth to restrictive feature: 20 to 40 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 4.8 inches (low)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: Not Identified
Ecological site: Loamy
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R036XB112NM
Present vegetation: blue grama, western wheatgrass, spike muhly, alkali sacaton, bottlebrush squirreltail, fourwing saltbush, galleta, winterfat, oneseed juniper, broom snakeweed, rabbitbrush, spineless horsebrush
Land capability subclass (nonirrigated): 6c
Typical Profile:
A—0 to 2 inches; fine sandy loam
Bt—2 to 13 inches; sandy clay loam
Bk1—13 to 19 inches; sandy clay loam
Bk2—19 to 35 inches; sandy loam
R—35 to 45 inches; bedrock

**Bond family soils**

*Taxonomic Classification:* Loamy, mixed, superactive, mesic Lithic Ustic Haplargids

*Landform:* Hills, mesas

*Parent material:* Eolian material and slope alluvium derived from sandstone

*Slope:* 1 to 8 percent

*Depth to restrictive feature:* 10 to 20 inches to bedrock, lithic

*Drainage class:* Well drained

*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)

*Available water capacity:* About 2.0 inches (very low)

*Shrink-swell potential:* About 1.5 percent (low)

*Flooding hazard:* None

*Ponding hazard:* None

*Runoff class:* High

*Hydrologic group:* D

*Calcium carbonate maximum:* About 5 percent

*Gypsum maximum:* None

*Salinity maximum:* About 2 dS/m (nonsaline)

*Sodium adsorption ratio maximum:* About 0 (nonsodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* Not Identified

*Ecological site:* Shallow Sandstone

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Ecological site ID:* R036XB121NM

*Present vegetation:* Bigelow sagebrush, blue grama, fourwing saltbush, Indian ricegrass, New Mexico feathergrass, galleta, little bluestem, sideoats grama, winterfat, ephedra, cliffrose, oneseed juniper, twoneedle pinyon

*Land capability subclass (nonirrigated):* 7s

Typical Profile:
A—0 to 2 inches; fine sandy loam
Bt1—2 to 5 inches; fine sandy loam
Bt2—5 to 14 inches; sandy clay loam
R—14 to 24 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

**37—Gish-Mentmore families complex, 1 to 8 percent slopes**

*Map Unit Setting*

*Landform setting:* drainageways, fan terraces, valley sides

*Elevation:* 6,100 to 7,200 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Gish family and similar soils: 45 percent
Mentmore family and similar soils: 40 percent
Minor components: 15 percent
- Fine, mixed, superactive, mesic Chromic Gypsisolts, Clayey 10-14" p.z.
- Gish, Clayey Bottom 10-14" p.z.

Component Descriptions

Gish family soils
Taxonomic Classification: Fine, mixed, superactive, mesic Ustic Haplocambids
Landform: Drainageways on fan terraces
Parent material: Fan alluvium derived from shale
Slope: 1 to 8 percent
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity: About 9.4 inches (high)
Shrink-swell potential: About 7.5 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: C
Calcium carbonate maximum: About 2 percent
Gypsum maximum: About 5 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 5 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Clay Loam Upland 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC307AZ
Present vegetation: western wheatgrass, Indian ricegrass, blue grama, Sporobolus, Wyoming big sagebrush, bottlebrush squirreltail, fourwing saltbush, galleta, winterfat, rabbitbrush
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; loam
Bw1—2 to 12 inches; clay loam
Bw2—12 to 20 inches; clay
Bk1—20 to 52 inches; clay
Bk2—52 to 60 inches; clay

Mentmore family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Haplargids
Landform: Fan terraces, valley sides
Parent material: Fan alluvium derived from sandstone and shale
Slope: 1 to 8 percent
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 11.7 inches (high)
Shrink-swell potential: About 7.5 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 1 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Loamy Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC313AZ
Present vegetation: western wheatgrass, blue grama, Indian ricegrass, Wyoming big sagebrush, bottlebrush squirreltail, galleta, muttongrass, oneseed juniper, broom snakeweed, Colorado pinyon, rabbitbrush
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; fine sandy loam
Bt—2 to 24 inches; clay loam
Bk1—24 to 36 inches; clay loam
Bk2—36 to 48 inches; clay loam
C—48 to 60 inches; sandy clay loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

38—Grieta family, 3 to 10 percent slopes

Map Unit Setting

Landform setting: plateaus
Elevation: 4,800 to 5,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 53 to 56 degrees F
Frost-free period: 150 to 180 days

Map Unit Composition

Grieta family and similar soils: 70 percent
Minor components: 30 percent

Component Descriptions

Grieta family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Typic Calciargids
Landform: Plateaus
Parent material: Eolian deposits
Slope: 3 to 10 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 9.1 inches (high)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 30 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB219AZ
Land capability subclass (irrigated): 4e
Land capability subclass (nonirrigated): 7e

Typical Profile:
- A—0 to 3 inches; sandy loam
- Bt—3 to 20 inches; sandy clay loam
- Btk—20 to 44 inches; sandy clay loam
- C—44 to 60 inches; sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

39—Haplogypsids-Torriorthents association, 5 to 60 percent slopes

Map Unit Setting

Landform setting: hills
Elevation: 4,800 to 5,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 53 to 56 degrees F
Frost-free period: 150 to 180 days

Map Unit Composition

Haplogypsids and similar soils: 30 percent
Torriorthents and similar soils: 30 percent
Minor components: 40 percent

Component Descriptions

Haplogypsids soils
Taxonomic Classification: Haplogypsids
Landform: Hills
Slope: 5 to 60 percent
Depth to restrictive feature: 40 to 60 inches to bedrock, lithic
Drainage class: Somewhat excessively drained
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Gypsum maximum: About 50 percent
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Mudstone/Sandstone Hills 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB201AZ
Land capability subclass (nonirrigated): 7e

Typical Profile:
   C—0 to 60 inches; variable

Torriorthents soils
Taxonomic Classification: Torriorthents
Landform: Hills
Slope: 5 to 60 percent
Drainage class: Well drained
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 10 percent
Gypsum maximum: About 10 percent
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Mudstone/Sandstone Hills 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB201AZ
Land capability subclass (nonirrigated): 7e

Typical Profile:
   C—0 to 60 inches; variable

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

40—Ives fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

Landform setting: flood plains
Elevation: 5,000 to 5,700 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Ives and similar soils: 85 percent
Minor components: 15 percent
   • Monue, Sandy Loam Upland 6-10" p.z.
   • Nakai, Sandy Loam Upland 6-10" p.z.
   • Sheppard, Sandy Upland 6-10" p.z.
Component Descriptions

Ives soils

*Taxonomic Classification:* Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents

*Landform:* Flood plains

*Parent material:* Stream alluvium derived from calcareous sandstone and/or slope alluvium derived from calcareous sandstone

*Slope:* 0 to 2 percent

*Drainage class:* Somewhat excessively drained

*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)

*Available water capacity:* About 8.3 inches (moderate)

*Shrink-swell potential:* About 1.0 percent (low)

*Flooding hazard:* Occasional

*Ponding hazard:* None

*Runoff class:* High

*Hydrologic group:* D

*Calcium carbonate maximum:* About 2 percent

*Gypsum maximum:* None

*Salinity maximum:* About 2 dS/m (nonsaline)

*Sodium adsorption ratio maximum:* About 0 (nonsodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands

*Ecological site:* Sandy Wash 6-10" p.z.

*Ecological site ID:* R035XB216AZ

*Present vegetation:* Indian ricegrass, Sporobolus, fourwing saltbush, galleta, western wheatgrass, blue grama, needleandthread, rabbitbrush

*Land capability subclass (nonirrigated):* 7c

Typical Profile:

- C1—0 to 2 inches; fine sandy loam
- C2—2 to 13 inches; fine sandy loam
- C3—13 to 34 inches; stratified fine sandy loam
- C4—34 to 80 inches; stratified fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

41—Ives fine sandy loam, clayey substratum, 1 to 3 percent slopes

Map Unit Setting

*Landform setting:* alluvial fans, valley sides

*Elevation:* 5,800 to 6,500 feet

*Mean annual precipitation:* 6 to 10 inches

*Mean annual air temperature:* 51 to 54 degrees F

*Frost-free period:* 130 to 160 days

Map Unit Composition

Ives, clayey substratum and similar soils: 90 percent

Minor components: 10 percent
• Jeddito, Loamy Terrace 5-8” p.z.

Component Descriptions

Ives, clayey substratum soils

Taxonomic Classification: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torrifuvents

Landform: Alluvial fans on valley sides

Parent material: Fan alluvium derived from sandstone and shale

Slope: 1 to 3 percent

Drainage class: Somewhat excessively drained

Slowest permeability: 0.6 to 2.0 in/hr (moderate)

Available water capacity: About 8.0 inches (moderate)

Shrink-swell potential: About 1.0 percent (low)

Flooding hazard: Occasional

Ponding hazard: None

Runoff class: Low

Hydrologic group: B

Calcium carbonate maximum: About 2 percent

Gypsum maximum: About 2 percent

Salinity maximum: About 2 dS/m (nonsaline)

Sodium adsorption ratio maximum: About 2 (slightly sodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands

Ecological site: Loamy Upland 6-10” p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB210AZ

Present vegetation: galleta, Indian ricegrass, blue grama, bottlebrush squirreltail, fourwing saltbush, broom snakeweed, rubber rabbitbrush, sand dropseed

Land capability subclass (nonirrigated): 7c

Typical Profile:

A—0 to 6 inches; fine sandy loam
C1—6 to 32 inches; fine sandy loam
C2—32 to 38 inches; fine sand
2C1—38 to 41 inches; clay loam
2C2—41 to 60 inches; clay

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

42—Iwela family-Nomrah-Vosburg complex, 1 to 40 percent slopes

Map Unit Setting

Landform setting: hills

Elevation: 6,800 to 7,800 feet

Mean annual precipitation: 14 to 18 inches

Mean annual air temperature: 48 to 51 degrees F

Frost-free period: 110 to 140 days

Map Unit Composition

Iwela family and similar soils: 40 percent
Nomrah and similar soils: 35 percent
Vosburg and similar soils: 15 percent
Minor components: 10 percent
- Badland
- Soils that are fine textured and sodium-affected

Component Descriptions

**Iwela family soils**

*Taxonomic Classification:* Fine-loamy, mixed, superactive, mesic Aridic Haplustalfs

*Landform:* Hills

*Parent material:* Eolian deposits and slope alluvium derived from sandstone and/or slope alluvium derived from sandstone and shale and/or colluvium derived from sandstone and shale

*Slope:* 10 to 40 percent

*Surface fragments:* About 1 percent gravel

*Drainage class:* Well drained

*Slowest permeability:* 0.2 to 0.6 in/hr (moderately slow)

*Available water capacity:* About 10.1 inches (high)

*Shrink-swell potential:* About 4.0 percent (moderate)

*Flooding hazard:* None

*Ponding hazard:* None

*Runoff class:* Very high

*Hydrologic group:* B

*Calcium carbonate maximum:* About 2 percent

*Gypsum maximum:* None

*Salinity maximum:* About 2 dS/m (nonsaline)

*Sodium adsorption ratio maximum:* About 0 (nonsodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush

*Ecological site:* Pinus edulis-Juniperus osteosperma/Artemisia tridentata ssp. wyomingensis-Artemisia nova/Poa fendleriana-Bouteloua gracilis

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Ecological site ID:* F035XF632AZ

*Present vegetation:* Wyoming big sagebrush, blue grama, muttongrass, black sagebrush, bottlebrush squirreltail, Indian ricegrass, broom snakeweed, galleta, prairie junegrass

*Land capability subclass (nonirrigated):* 6c

Typical Profile:

- A—0 to 2 inches; loamy fine sand
- Bw—2 to 7 inches; fine sandy loam
- Bt1—7 to 13 inches; loam
- Bt2—13 to 19 inches; clay loam
- Bt3—19 to 28 inches; loam
- Bt4—28 to 45 inches; loam
- Bk1—45 to 50 inches; clay loam
- Bk2—50 to 60 inches; loam

**Nomrah soils**

*Taxonomic Classification:* Fine-loamy, mixed, superactive, mesic Calcidic Haplustalfs

*Landform:* Hills

*Parent material:* Eolian deposits and slope alluvium derived from sandstone

*Slope:* 2 to 10 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.8 inches (moderate)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: C
Calcium carbonate maximum: About 30 percent
Gypsum maximum: About 1 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp.
wyomingensis-Purshia tridentata/Poa fendleriana-Achnatherum hymenoides
Other ecological sites may occur in this map unit and vary in extent between
delineations.
Ecological site ID: F035XF628AZ
Present vegetation: Wyoming big sagebrush, muttongrass, Indian ricegrass, blue
grama, bottlebrush squirreltail, broom snakeweed, galleta, prairie junegrass
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 3 inches; fine sandy loam
Bt1—3 to 8 inches; sandy clay loam
Bt2—8 to 23 inches; sandy clay loam
Bt3—23 to 32 inches; sandy clay loam
Btk1—32 to 43 inches; sandy clay loam
Btk2—43 to 58 inches; sandy clay loam
BC—58 to 62 inches; fine sandy loam

Vosburg soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Pachic Argiustolls
Landform: Hills
Parent material: Slope alluvium derived from sandstone and shale
Slope: 1 to 5 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 9.5 inches (high)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 1 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Loamy Upland 13-17" p.z.
Other ecological sites may occur in this map unit and vary in extent between
delineations.
Ecological site ID: R035XF605AZ
Present vegetation: western wheatgrass, Wyoming big sagebrush, blue grama, bottlebrush squirreltail, muttongrass, Indian ricegrass, broom snakeweed, galleta

Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 4 inches; loam
- BA—4 to 10 inches; loam
- Bt1—10 to 21 inches; loam
- Bt2—21 to 30 inches; loam
- BC—30 to 42 inches; loam
- Bk—42 to 65 inches; fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

43—Jeddito loamy fine sand, 0 to 5 percent slopes

Map Unit Setting

Landform setting: stream terraces
Elevation: 5,500 to 6,000 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Jeddito and similar soils: 90 percent
Minor components: 10 percent

Component Descriptions

Jeddito soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents
Landform: Stream terraces
Parent material: Alluvium derived from sandstone
Slope: 0 to 5 percent
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 7.0 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: Rare
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 1 percent
Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 13 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Terrace 6-10" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB222AZ
Present vegetation: Indian ricegrass, fourwing saltbush, galleta, rabbitbrush, alkali sacaton, blue grama, sand dropseed

Land capability subclass (irrigated): 3e
Land capability subclass (nonirrigated): 7c

Typical Profile:
- A—0 to 2 inches; loamy fine sand
- C1—2 to 18 inches; stratified loamy fine sand
- C2—18 to 60 inches; stratified fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

44—Jocity fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

Landform setting: flood plains
Elevation: 4,800 to 6,000 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Jocity and similar soils: 95 percent
Minor components: 5 percent
- Wepo, Clayey Bottom 6-10” p.z.
- Jocity saline-sodic, occasionally flooded, Saline Bottom 6-10” p.z.

Component Descriptions

Jocity soils
Taxonomic Classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents
Landform: Flood plains
Parent material: Stream alluvium derived from sandstone and shale
Slope: 0 to 3 percent
Drainage class: Well drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 9.4 inches (high)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: Occasional
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 10 percent
Gypsum maximum: About 5 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Clayey Fan 6-10” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB239AZ
**Present vegetation:** galleta, fourwing saltbush, Indian ricegrass, alkali sacaton, bottlebrush squirreltail, winterfat

*Land capability subclass (irrigated): 3w*

*Land capability subclass (nonirrigated): 7c*

Typical Profile:

A—0 to 3 inches; fine sandy loam

C—3 to 84 inches; stratified loamy fine sand to fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

**45—Jocity sandy clay loam, saline-sodic, 0 to 3 percent slopes**

**Map Unit Setting**

*Landform setting:* flood plains

*Elevation:* 4,800 to 5,500 feet

*Mean annual precipitation:* 6 to 10 inches

*Mean annual air temperature:* 51 to 54 degrees F

*Frost-free period:* 130 to 160 days

**Map Unit Composition**

Jocity and similar soils: 80 percent

Minor components: 20 percent

- Jocity, occasionally flooded, Loamy Bottom 6-10” p.z.
- Sheppard, Sandy Upland 6-10” p.z.

**Component Descriptions**

**Jocity soils**

*Taxonomic Classification:* Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents

*Landform:* Flood plains

*Parent material:* Stream alluvium derived from sandstone and shale

*Slope:* 0 to 3 percent

*Drainage class:* Well drained

*Slowest permeability:* 0.2 to 0.6 in/hr (moderately slow)

*Available water capacity:* About 5.4 inches (low)

*Shrink-swell potential:* About 4.5 percent (moderate)

*Flooding hazard:* Occasional

*Ponding hazard:* None

*Runoff class:* High

*Hydrologic group:* D

*Calcium carbonate maximum:* About 15 percent

*Gypsum maximum:* None

*Salinity maximum:* About 32 dS/m (strongly saline)

*Sodium adsorption ratio maximum:* About 13 (moderately sodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands

*Ecological site:* Loamy Wash 6-10” p.z. Saline

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Ecological site ID:* R035XB211AZ
Present vegetation: alkali sacaton, galleta, mound saltbush, bottlebrush squirreltail, fourwing saltbush, black greasewood

Land capability subclass (irrigated): 4w
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 9 inches; sandy clay loam
C1—9 to 41 inches; sandy clay loam
C2—41 to 60 inches; fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

46—Jocity family, 0 to 1 percent slopes

Map Unit Setting

Landform setting: flood plains, valley floors
Elevation: 5,800 to 6,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Jocity family and similar soils: 85 percent
Minor components: 15 percent
• Ives, occasionally flooded, Loamy Bottom 5-8” p.z.
• Notal, Clay Loam Terrace 5-8” p.z. Sodic

Component Descriptions

Jocity family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents
Landform: Flood plains on valley floors
Parent material: Stream alluvium derived from sandstone and shale
Slope: 0 to 1 percent
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 11.8 inches (high)
Shrink-swell potential: About 6.0 percent (high)
Flooding hazard: Occasional
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: About 2 percent
Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 20 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Loamy Wash 6-10” p.z. Saline
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB211AZ
Present vegetation: alkali sacaton, galleta, mound saltbush, Indian ricegrass, bottlebrush squirreltail, western wheatgrass

Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 1 inch; clay loam
Ck—1 inch to 20 inches; clay loam
C1—20 to 27 inches; clay loam
C2—27 to 40 inches; clay loam
Cy—40 to 60 inches; clay loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

47—Joraibi clay loam, 0 to 2 percent slopes

Map Unit Setting

Landform setting: flood plains
Elevation: 5,100 to 5,600 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Joraibi and similar soils: 90 percent
Minor components: 10 percent
- Jocity, sodium-affected and occasionally flooded, Salty Bottom 6-10” p.z.
- Ives, occasionally flooded, Sandy Bottom 6-10” p.z.

Component Descriptions

Joraibi soils

Taxonomic Classification: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, mesic Typic Torrifluvents

Landform: Flood plains
Parent material: Stream alluvium derived from sandstone and shale
Slope: 0 to 2 percent
Drainage class: Well drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 5.2 inches (low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: Occasional
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 16 dS/m (moderately saline)
Sodium adsorption ratio maximum: About 45 (strongly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Loamy Wash 6-10” p.z. Saline

Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB211AZ

Present vegetation: alkali sacaton, galleta, black greasewood, blue grama, bottlebrush squirreltail, mound saltbush, western wheatgrass

Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 2 inches; clay loam
C1—2 to 23 inches; stratified sandy clay loam to clay loam
C2—23 to 54 inches; stratified sand to very fine sandy loam
C3—54 to 84 inches; stratified very fine sandy loam to clay loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

48—Kinusta family-Eslendo-Rock outcrop complex, 15 to 70 percent slopes

Map Unit Setting

Landform setting: escarpments, hills, plateaus
Elevation: 5,200 to 6,600 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Kinusta family and similar soils: 45 percent
Eslendo and similar soils: 25 percent
Rock outcrop: 20 percent
Minor components: 10 percent
• Badland
• Strych family, Breaks 10-14” p.z.
• Pinavetes family, Sandy Upland 10-14” p.z.
• Arches, Sandstone Upland 10-14” p.z.

Component Descriptions

Kinusta family soils

Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic, shallow
Ustic Torriorthents
Landform: Escarpments on plateaus
Parent material: Colluvium and residuum weathered from limestone and sandstone
and/or colluvium and residuum weathered from siltstone
Slope: 15 to 60 percent
Surface fragments: About 5 percent gravel
Depth to restrictive feature: 5 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 0.8 inches (very low)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 10 percent
Gypsum maximum: About 1 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Breaks 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA101AZ
Present vegetation: blue grama, New Mexico feathergrass, Bigelow sagebrush, Indian ricegrass, Sporobolus, Stansbury cliffrose, black grama, galleta, Greene rabbitbrush, Utah juniper
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; sandy clay loam
C—2 to 5 inches; sandy clay loam
Cr—5 to 60 inches; bedrock

Eslendo soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents
Landform: Escarpments, hills
Parent material: Colluvium and residuum weathered from sandstone and shale
Slope: 35 to 70 percent
Surface fragments: About 20 percent gravel
Depth to restrictive feature: 5 to 10 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 0.9 inches (very low)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 1 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 5 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Breaks 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA101AZ
Present vegetation: Bigelow sagebrush, New Mexico feathergrass, Indian ricegrass, Stansbury cliffrose, black grama, blue grama, Greene rabbitbrush, galleta, Utah juniper, skunkbush sumac
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; gravelly sandy clay loam
C—2 to 7 inches; gravelly sandy clay loam
Cr—7 to 60 inches; bedrock
Rock outcrop
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between
delineations.

See “Soil Series and Their Morphology” for a detailed description of the soil
component and its Range in Characteristics.

49—Kinusta-Strych families-Rock outcrop complex, 30 to
65 percent slopes

Map Unit Setting
Landform setting: escarpments, mesas, plateaus
Elevation: 6,000 to 7,000 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition
Kinusta family and similar soils: 40 percent
Strych family and similar soils: 30 percent
Rock outcrop: 20 percent
Minor components: 10 percent
- Strych family, Breaks 10-14” p.z.
- Teesto, Shallow Loamy 10-14” p.z.
- Rock outcrop

Component Descriptions
Kinusta family soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic, shallow
Ustic Torriorthents
Landform: Escarpments on mesas, escarpments on plateaus
Parent material: Colluvium and residuum derived from siltstone and/or colluvium and
residuum weathered from limestone and sandstone
Slope: 30 to 65 percent
Surface fragments: About 35 percent medium gravel, about 10 percent coarse gravel
Depth to restrictive feature: 5 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 0.8 inches (very low)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 10 percent
Gypsum maximum: About 1 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Breaks 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between
delineations.
Ecological site ID: R035XA101AZ
Present vegetation: blue grama, New Mexico feathergrass, Bigelow sagebrush,
Indian ricegrass, Sporobolus, black grama, galleta, shadscale saltbush
Land capability subclass (nonirrigated): 6c

Typical Profile:
  A—0 to 3 inches; sandy loam
  C—3 to 12 inches; loam
  Cr—12 to 60 inches; bedrock

Strych family soils
Taxonomic Classification: Loamy-skeletal, mixed, superactive, mesic Ustic
  Haplocalcids
Landform: Escarpments on mesas, escarpments on plateaus
Parent material: Fan alluvium and colluvium derived from conglomerate and/or fan
  alluvium and colluvium derived from sandstone and shale
Slope: 30 to 65 percent
Surface fragments: About 25 percent cobbles, about 15 percent medium gravel,
  about 10 percent coarse gravel
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 2.5 inches (very low)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: B
Calcium carbonate maximum: About 35 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Breaks 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between
delineations.
Ecological site ID: R035XA101AZ
Present vegetation: blue grama, New Mexico feathergrass, Bigelow sagebrush,
  Indian ricegrass, galleta, alkali sacaton, fourwing saltbush, shadscale saltbush,
  Greene rabbitbrush, Utah juniper, broom snakeweed
Land capability subclass (nonirrigated): 6c

Typical Profile:
  A—0 to 3 inches; very cobbly sandy clay loam
  Bw—3 to 11 inches; extremely cobbly loam
  Bk1—11 to 30 inches; extremely cobbly sandy clay loam
  Bk2—30 to 38 inches; extremely cobbly sandy clay loam
  C—38 to 60 inches; extremely cobbly sandy clay loam

Rock outcrop
Flooding hazard: None
Ponding hazard: None

Major Land Resource Area: 35; Colorado Plateau

Other ecological sites may occur in this map unit and vary in extent between delineations.

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

50—Kinusta-Tekapo-Reef families complex, 1 to 60 percent slopes

Map Unit Setting

Landform setting: escarpments, mesas, plateaus
Elevation: 5,300 to 5,800 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Kinusta family and similar soils: 40 percent
Tekapo family and similar soils: 35 percent
Reef family and similar soils: 20 percent
Minor components: 5 percent
• Rock outcrop
• Badland

Component Descriptions

Kinusta family soils

Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents

Landform: Escarpments on mesas, escarpments on plateaus
Parent material: Colluvium and residuum derived from siltstone and/or colluvium and residuum weathered from limestone and sandstone
Slope: 8 to 60 percent
Surface fragments: About 14 percent cobbles, about 5 percent stones, about 1 percent boulders, about 80 percent gravel
Depth to restrictive feature: 5 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 2.2 inches (very low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Breaks 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.

**Ecological site ID:** R035XA101AZ

**Present vegetation:** blue grama, New Mexico feathergrass, Bigelow sagebrush, Indian ricegrass, Sporobolus, Stansbury cliffrose, black grama, galleta, Greene rabbitbrush, Utah juniper

**Land capability subclass (nonirrigated):** 6c

Typical Profile:
- A—0 to 3 inches; gravelly sandy loam
- Bw—3 to 8 inches; gravelly sandy loam
- Ck—8 to 19 inches; fine sandy loam
- Cr—19 to 60 inches; bedrock

**Tekapo family soils**

**Taxonomic Classification:** Clayey, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents

**Landform:** Escarpments on mesas, escarpments on plateaus

**Parent material:** Slope alluvium and colluvium over residuum weathered from shale

**Slope:** 1 to 45 percent

**Surface fragments:** About 20 percent gravel

**Depth to restrictive feature:** 6 to 20 inches to bedrock, lithic

**Drainage class:** Well drained

**Slowest permeability:** 0.2 to 0.6 in/hr (moderately slow)

**Available water capacity:** About 3.6 inches (low)

**Shrink-swell potential:** About 7.5 percent (high)

**Flooding hazard:** None

**Ponding hazard:** None

**Runoff class:** High

**Hydrologic group:** D

**Calcium carbonate maximum:** About 5 percent

**Gypsum maximum:** About 1 percent

**Salinity maximum:** About 2 dS/m (nonsaline)

**Sodium adsorption ratio maximum:** About 2 (slightly sodic)

**Major Land Resource Area:** 35; Colorado Plateau

**Land Resource Unit:** 35-1AZ; Colorado Plateau Mixed Grass Plains

**Ecological site:** Shallow Loamy 10-14” p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

**Ecological site ID:** R035XA119AZ

**Present vegetation:** galleta, Bigelow sagebrush, alkali sacaton, blue grama, needleandthread, Mormon tea, New Mexico feathergrass, bottlebrush squirreltail, fourwing saltbush, shadscale saltbush, banana yucca, Utah juniper

**Land capability subclass (nonirrigated):** 6c

Typical Profile:
- A—0 to 3 inches; channery clay loam
- Bw—3 to 8 inches; clay loam
- C—8 to 18 inches; clay loam
- Cr—18 to 60 inches; bedrock

**Reef family soils**

**Taxonomic Classification:** Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents

**Landform:** Escarpments on mesas, escarpments on plateaus
Parent material: Colluvium over residuum weathered from limestone and sandstone
Slope: 12 to 45 percent
Surface fragments: About 35 percent gravel
Depth to restrictive feature: 10 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 0.8 inches (very low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Shallow Loamy 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA119AZ
Present vegetation: needleandthread, Bigelow sagebrush, Indian ricegrass, blue grama, bottlebrush squirreltail, galleta, broom snakeweed, shadscale saltbush, Utah juniper

Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 3 inches; very gravelly loam
Bk—3 to 10 inches; very flaggy loam
R—10 to 20 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

51—Klizhin-Sandark families complex, 20 to 65 percent slopes

Map Unit Setting

Landform setting: fan terraces, mountains
Elevation: 7,400 to 8,400 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 40 to 43 degrees F
Frost-free period: 80 to 110 days

Map Unit Composition

Klizhin family and similar soils: 45 percent
Sandark family and similar soils: 40 percent
Minor components: 15 percent
• Kunz, ponderosa pine forest
• Sponseller family, ponderosa pine forest
• Deza, ponderosa pine forest
• Rock outcrop
• Sandark family, 1 to 20 percent slopes

Component Descriptions

Klizhin family soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, frigid Pachic Haplustolls
Landform: Mountains
Parent material: Slope alluvium and residuum weathered from sandstone
Slope: 20 to 65 percent
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 7.5 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Pinus ponderosa-Populus tremuloides/Symphoricarpos oreophilus/
Carex geophila-Geranium
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XH818AZ
Present vegetation: Carex, Kentucky bluegrass, bottlebrush squirreltail, mountain
snowberry, Arizona fescue, Gambel oak, creeping barberry, nodding brome,
kinnikinnick, rosy pussytoes
Land capability subclass (nonirrigated): 5c

Typical Profile:
Oe—0 to 1 inch; slightly decomposed plant material
A1—1 inch to 4 inches; loamy fine sand
A2—4 to 11 inches; fine sandy loam
A3—11 to 18 inches; fine sandy loam
Bw1—18 to 25 inches; fine sandy loam
Bw2—25 to 35 inches; fine sandy loam
Bw3—35 to 47 inches; fine sandy loam
BC—47 to 55 inches; loamy fine sand
C1—55 to 60 inches; loamy fine sand
C2—60 to 70 inches; sand

Sandark family soils
Taxonomic Classification: Sandy, mixed, frigid Entic Haplustolls
Landform: Fan terraces on mountains
Parent material: Slope alluvium derived from sandstone
Slope: 20 to 25 percent
Drainage class: Somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 3.1 inches (low)
Shrink-swell potential: About 3.1 inches (low)
Flooding hazard: None
**Ponding hazard:** None

**Runoff class:** Medium

**Hydrologic group:** A

**Calcium carbonate maximum:** None

**Gypsum maximum:** None

**Salinity maximum:** About 2 dS/m (nonsaline)

**Sodium adsorption ratio maximum:** About 0 (nonsodic)

**Major Land Resource Area:** 35; Colorado Plateau

**Land Resource Unit:** 35-8AZ; Colorado Plateau Ponderosa Pine Forests

**Ecological site:** Pinus ponderosa/Quercus gambelii/Carex geophila-Lupinus argenteus

Other ecological sites may occur in this map unit and vary in extent between delineations.

**Ecological site ID:** F035XH812AZ

**Present vegetation:** western brackenfern, nodding brome, silvery lupine, Arizona fescue, Carex, Fendler ceanothus, Gambel oak, mountain muhly, needleandthread, yucca

**Land capability subclass (nonirrigated):** 5c

**Typical Profile:**

- **A—** 0 to 14 inches; loamy fine sand
- **AC—** 14 to 24 inches; sand
- **C—** 24 to 60 inches; sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

## 52—Kunz-Yahmore family complex, 2 to 35 percent slopes

### Map Unit Setting

**Landform setting:** plateaus, structural benches

**Elevation:** 7,500 to 8,000 feet

**Mean annual precipitation:** 18 to 22 inches

**Mean annual air temperature:** 40 to 43 degrees F

**Frost-free period:** 80 to 110 days

### Map Unit Composition

Kunz and similar soils: 50 percent

Yahmore family and similar soils: 40 percent

Minor components: 10 percent

- Sponseller family, ponderosa pine forest
- Kunz, ponderosa pine forest
- Cumulic Endoaquolls, occasionally flooded, wet meadow
- Rock outcrop

### Component Descriptions

**Kunz soils**

**Taxonomic Classification:** Fine-loamy, mixed, superactive, frigid Typic Haplustalfs

**Landform:** High elevation plateaus, structural benches

**Parent material:** Slope alluvium derived from sandstone and shale

**Slope:** 10 to 35 percent

**Surface fragments:** About 1 percent gravel
Drainage class: Well drained  
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)  
Available water capacity: About 9.6 inches (high)  
Shrink-swell potential: About 4.5 percent (moderate)  
Flooding hazard: None  
Ponding hazard: None  
Runoff class: High  
Hydrologic group: B  
Calcium carbonate maximum: None  
Gypsum maximum: None  
Salinity maximum: About 2 dS/m (nonsaline)  
Sodium adsorption ratio maximum: About 0 (nonsodic)  
Major Land Resource Area: 35; Colorado Plateau  
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests  
Ecological site: Pinus ponderosa/Quercus gambelii-Artemisia tridentata/Bouteloua gracilis-Carex geophila  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
Ecological site ID: F035XH811AZ  
Present vegetation: blue grama, Gambel oak, bottlebrush squirreltail, needleandhread, mountain muhly, pingue rubberweed, prairie junegrass, silvery lupine, Rocky Mountain juniper  
Land capability subclass (nonirrigated): 5c  
Typical Profile:  
A—0 to 1 inch; loam  
Bt1—1 inch to 13 inches; loam  
Bt2—13 to 23 inches; sandy clay loam  
Bt3—23 to 50 inches; sandy clay loam  
Btk—50 to 60 inches; clay loam  
Yahmore family soils  
Taxonomic Classification: Coarse-loamy, mixed, superactive, frigid Pachic Argiustolls  
Landform: High elevation plateaus, structural benches  
Parent material: Slope alluvium derived from basalt and/or slope alluvium derived from sandstone and shale  
Slope: 2 to 10 percent  
Surface fragments: About 2 percent gravel, about 1 percent cobbles  
Drainage class: Well drained  
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)  
Available water capacity: About 8.2 inches (moderate)  
Shrink-swell potential: About 1.5 percent (low)  
Flooding hazard: None  
Ponding hazard: None  
Runoff class: Low  
Hydrologic group: B  
Calcium carbonate maximum: About 1 percent  
Gypsum maximum: None  
Salinity maximum: About 2 dS/m (nonsaline)  
Sodium adsorption ratio maximum: About 0 (nonsodic)  
Major Land Resource Area: 35; Colorado Plateau  
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests  
Ecological site: Pinus ponderosa/Quercus gambelii/Carex geophila-Lupinus argenteus
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: F035XH812AZ

Present vegetation: blue grama, Gambel oak, bottlebrush squirreltail, mountain big sagebrush, needleandthread, Rocky Mountain juniper, mountain muhly, pingue rubberweed, silvery lupine, western wheatgrass, Colorado pinyon

Land capability subclass (nonirrigated): 5c

Typical Profile:
- A—0 to 1 inch; loamy sand
- BA—1 inch to 12 inches; fine sandy loam
- Bt—12 to 28 inches; fine sandy loam
- Bk—28 to 60 inches; fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

53—Kydestea-Zyme-Tonalea complex, 5 to 50 percent slopes

Map Unit Setting

Landform setting: dunes, hills

Elevation: 5,900 to 6,800 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 160 days

Map Unit Composition

Kydestea and similar soils: 45 percent

Zyme and similar soils: 25 percent

Tonalea and similar soils: 20 percent

Minor components: 10 percent

Component Descriptions

Kydestea soils

Taxonomic Classification: Loamy-skeletal, mixed, superactive, calcareous, mesic

Aridic Lithic Ustorthents

Landform: Hills

Parent material: Derived from slope alluvium

Slope: 5 to 50 percent

Depth to restrictive feature: 4 to 19 inches to bedrock, lithic

Drainage class: Well drained

Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 1.3 inches (very low)

Shrink-swell potential: About 4.5 percent (moderate)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Hydrologic group: D

Calcium carbonate maximum: About 15 percent

Gypsum maximum: None

Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Juniperus osteosperma/Purshia stansburiana-Artemisia bigelovii/Pluraphis jamesii-Achnatherum hymenoides
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XC321AZ
Present vegetation:
   Common trees: Utah juniper, twoneedle pinyon
   Other plants: Bigelow sagebrush, Stansbury cliffrose, galleta, Indian ricegrass, Utah juniper, Mormon tea, bottlebrush squirreltail, twoneedle pinyon
Land capability subclass (nonirrigated): 6s

Typical Profile:
   A—0 to 1 inch; very channery sandy clay loam
   C1—1 inch to 5 inches; very channery sandy clay loam
   C2—5 to 15 inches; extremely channery sandy clay loam
   R—15 to 25 inches; bedrock

Zyme soils
Taxonomic Classification: Clayey, smectitic, calcareous, mesic, shallow Ustic Torriorthents
Landform: Hills
Parent material: Residuum weathered from shale
Slope: 5 to 50 percent
Depth to restrictive feature: 6 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 3.1 inches (low)
Shrink-swell potential: About 7.5 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 10 percent
Gypsum maximum: About 5 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Clay Loam Upland 10-14" p.z. Limy
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC335AZ
Present vegetation:
   Common trees: twoneedle pinyon, twoneedle pinyon
   Other plants: galleta, shadscale saltbush, alkali sacaton, bottlebrush squirreltail, Indian ricegrass, big sagebrush, buckwheat
Land capability subclass (nonirrigated): 6s

Typical Profile:
   A—0 to 1 inch; clay loam
   C—1 inch to 18 inches; clay
   Cr—18 to 22 inches; bedrock
Tonalea soils

*Taxonomic Classification:* Mixed, mesic Typic Ustipsamments

*Landform:* Dunes on hills

*Parent material:* Eolian deposits derived from sandstone

*Slope:* 5 to 20 percent

*Depth to restrictive feature:* 20 to 39 inches to bedrock, lithic

*Drainage class:* Excessively drained

*Slowest permeability:* 6.0 to 20 in/hr (rapid)

*Available water capacity:* About 2.0 inches (very low)

*Shrink-swell potential:* About 1.5 percent (low)

*Flooding hazard:* None

*Ponding hazard:* None

*Runoff class:* High

*Hydrologic group:* C

*Calcium carbonate maximum:* About 10 percent

*Gypsum maximum:* None

*Salinity maximum:* About 2 dS/m (nonsaline)

*Sodium adsorption ratio maximum:* About 0 (nonsodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-1AZ; Colorado Plateau Mixed Grass Plains

*Ecological site:* Sandy Upland 10-14" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Ecological site ID:* R035XA118AZ

*Present vegetation:*

*Common trees:* Utah juniper, twoneedle pinyon

*Other plants:* Indian ricegrass, Stansbury cliffrose, Utah juniper, Wyoming big sagebrush, needleandthread, blue grama, galleta, twoneedle pinyon

*Land capability subclass (irrigated):* 4e

*Land capability subclass (nonirrigated):* 6e

*Typical Profile:*

A—0 to 3 inches; loamy fine sand

C—3 to 24 inches; loamy fine sand

Cr—24 to 26 inches; bedrock

R—26 to 36 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

54—Manuelito-Klizhin family-Stozuni complex, 8 to 45 percent slopes

**Map Unit Setting**

*Landform setting:* cuestas, plateaus

*Elevation:* 7,600 to 8,000 feet

*Mean annual precipitation:* 18 to 22 inches

*Mean annual air temperature:* 40 to 48 degrees F

*Frost-free period:* 80 to 130 days

**Map Unit Composition**

Manuelito and similar soils: 35 percent

Klizhin family and similar soils: 30 percent
Stozuni and similar soils: 25 percent
Minor components: 10 percent

Component Descriptions

Manuelito soils
*Taxonomic Classification:* Fine-loamy, mixed, superactive, mesic Typic Haplustalfs
*Landform:* Southerly-facing plateaus
*Parent material:* Slope alluvium derived from sandstone and/or eolian deposits and slope alluvium derived from sandstone and shale and/or slope alluvium and residuum weathered from sandstone
*Slope:* 8 to 15 percent
*Depth to restrictive feature:* 20 to 40 inches to bedrock, lithic; 20 to 40 inches to bedrock, paralithic
*Drainage class:* Well drained
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)
*Available water capacity:* About 4.3 inches (low)
*Shrink-swell potential:* About 4.0 percent (moderate)
*Flooding hazard:* None
*Ponding hazard:* None
*Runoff class:* Medium
*Hydrologic group:* C
*Calcium carbonate maximum:* None
*Gypsum maximum:* None
*Salinity maximum:* About 2 dS/m (nonsaline)
*Sodium adsorption ratio maximum:* About 0 (nonsodic)
*Major Land Resource Area:* 35; Colorado Plateau
*Land Resource Unit:* 35-8AZ; Colorado Plateau Ponderosa Pine Forests
*Ecological site:* Pinus ponderosa/Quercus gambelii-Artemisia tridentata/Bouteloua gracilis-Carex geophila
Other ecological sites may occur in this map unit and vary in extent between delineations.
*Ecological site ID:* F035XH811AZ
*Present vegetation:*
  *Common trees:* Rocky Mountain juniper, twoneedle pinyon, ponderosa pine
  *Other plants:* mountain muhly, blue grama, muttongrass, needleandthread, Gambel oak, bottlebrush squirreltail, broom snakeweed, prairie junegrass, true mountainmahogany, Rocky Mountain juniper, western yarrow
*Land capability subclass (nonirrigated):* 5c

Typical Profile:
- A—0 to 5 inches; fine sandy loam
- Bt1—5 to 10 inches; sandy clay loam
- Bt2—10 to 25 inches; sandy clay loam
- Bt3—25 to 29 inches; sandy clay loam
- Cr—29 to 32 inches; bedrock
- R—32 to 42 inches; bedrock

Klizhin family soils
*Taxonomic Classification:* Coarse-loamy, mixed, superactive, frigid Pachic Haplustolls
*Landform:* Northerly-facing plateaus
*Parent material:* Slope alluvium and residuum weathered from sandstone
*Slope:* 8 to 15 percent
*Drainage class:* Well drained
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)
*Available water capacity:* About 7.2 inches (moderate)
Shrink-swell potential: About 0.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 1 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Pinus ponderosa/Quercus gambelii-Artemisia tridentata/Bouteloua gracilis-Carex geophila
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XH811AZ
Present vegetation:
Common trees: Rocky Mountain juniper, ponderosa pine
Other plants: blue grama, bottlebrush squirreltail, mountain muhly, muttongrass, Gambel oak, pingue rubberweed, Rocky Mountain juniper
Land capability subclass (nonirrigated): 5c
Typical Profile:
Oe—0 to 2 inches; slightly decomposed plant material
A—2 to 5 inches; fine sandy loam
Bw1—5 to 32 inches; fine sandy loam
Bw2—32 to 60 inches; stony fine sandy loam
Stozuni soils
Taxonomic Classification: Loamy, mixed, superactive, nonacid, frigid Lithic Ustorthents
Landform: Cuestas, plateaus
Parent material: Slope alluvium derived from sandstone
Slope: 15 to 45 percent
Depth to restrictive feature: 5 to 10 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 1.0 inches (very low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Pinus ponderosa-Populus tremuloides/Symphoricarpos oreophilus/Carex geophila-Geranium
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XH818AZ
Present vegetation:
Common trees: Rocky Mountain juniper, ponderosa pine
Other plants: blue grama, Kentucky bluegrass, muttongrass, Gambel oak, bottlebrush squirreltail, mountain muhly, prairie junegrass, Douglas-fir, Rocky Mountain juniper

Land capability subclass (nonirrigated): 5c

Typical Profile:
Oi—0 to 1 inch; slightly decomposed plant material
C—1 inch to 7 inches; loam
R—7 to 17 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

55—Manuelito-Verite complex, 8 to 45 percent slopes

Map Unit Setting

Landform setting: plateaus
Elevation: 7,500 to 8,000 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 110 to 130 days

Map Unit Composition

Manuelito and similar soils: 45 percent
Verite and similar soils: 35 percent
Minor components: 20 percent
• Rock outcrop
• Soils similar to Manuelito that are deep and very deep

Component Descriptions

Manuelito soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Typic Haplustalfs
Landform: Plateau dipslopes
Parent material: Eolian deposits and slope alluvium derived from sandstone and shale and/or eolian deposits over residuum weathered from sandstone and shale
Slope: 1 to 15 percent
Depth to restrictive feature: 20 to 40 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 6.2 inches (moderate)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: C
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests

Ecological site: Pinus ponderosa/Quercus gambelii-Artemisia tridentata/Bouteloua gracilis-Carex geophila

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: F035XH811AZ

Present vegetation: muttongrass, mountain muhly, blue grama, Gambel oak, bottlebrush squirreltail, prairie junegrass, pingue rubberweed, western yarrow

Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 5 inches; loam
- Bt1—5 to 16 inches; clay loam
- Bt2—16 to 27 inches; sandy clay loam
- C1—27 to 31 inches; loam
- C2—31 to 36 inches; loam
- 2R—36 to 46 inches; bedrock

Verite soils

Taxonomic Classification: Loamy, mixed, superactive, mesic Lithic Haplustalfs

Landform: Plateaus

Parent material: Eolian deposits over residuum weathered from sandstone and shale

Slope: 8 to 45 percent

Depth to restrictive feature: 10 to 20 inches to bedrock, lithic

Drainage class: Well drained

Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 2.5 inches (very low)

Shrink-swell potential: About 4.0 percent (moderate)

Flooding hazard: None

Ponding hazard: None

Runoff class: High

Hydrologic group: D

Calcium carbonate maximum: None

Gypsum maximum: None

Salinity maximum: About 1 dS/m (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests

Ecological site: Pinus ponderosa/Bouteloua gracilis-Muhlenbergia montana

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: F035XH827AZ

Present vegetation: mountain muhly, muttongrass, blue grama, Gambel oak, bottlebrush squirreltail, prairie junegrass, western yarrow, creeping barberry, pine dropseed

Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 3 inches; loam
- Bt1—3 to 7 inches; sandy clay loam
- Bt2—7 to 11 inches; clay loam
- Bt3—11 to 14 inches; clay loam
- R—14 to 24 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
56—Marcou family, 1 to 6 percent slopes

Map Unit Setting

Landform setting: dunes, fan terraces
Elevation: 5,200 to 6,000 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Marcou family and similar soils: 85 percent
Minor components: 15 percent
• Sheppard, Sandy Upland 6-10” p.z.
• Monue, Sandy Loam Upland, 6-10” p.z.
• Jocity, Loamy Bottom 6-10” p.z.

Component Descriptions

Marcou family soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents
Landform: Dunes on fan terraces
Parent material: Eolian material and fan alluvium derived from sandstone
Slope: 1 to 6 percent
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 8.3 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 5 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB219AZ
Present vegetation: Indian ricegrass, galleta, Sporobolus, blue grama, black grama, fourwing saltbush, winterfat
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 3 inches; fine sandy loam
C1—3 to 12 inches; fine sandy loam
C2—12 to 37 inches; fine sandy loam
C3—37 to 55 inches; fine sandy loam
C4—55 to 75 inches; fine sandy loam
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

57—Marcou family, strongly sodic, 1 to 8 percent slopes

Map Unit Setting

Landform setting: fan terraces
Elevation: 4,800 to 5,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Marcou family and similar soils: 80 percent
Minor components: 20 percent

Component Descriptions

Marcou family soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents
Landform: Dunes on fan terraces
Parent material: Eolian material and fan alluvium derived from sandstone
Slope: 1 to 8 percent
Drainage class: Moderately well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 5.5 inches (low)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 20 percent
Gypsum maximum: None
Salinity maximum: About 8 dS/m (slightly saline)
Sodium adsorption ratio maximum: About 30 (strongly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Upland 6-10” p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB223AZ
Land capability subclass (nonirrigated): 7e

Typical Profile:
A—0 to 6 inches; loamy sand
C1—6 to 47 inches; sandy loam
C2—47 to 54 inches; sandy clay loam
C3—54 to 60 inches; loamy coarse sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
58—Marcou family-Burnswick complex, 1 to 3 percent slopes

Map Unit Setting

Landform setting: dunes, fan terraces
Elevation: 5,400 to 6,200 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Marcou family and similar soils: 45 percent
Burnswick and similar soils: 40 percent
Minor components: 15 percent
• Sheppard, Sandy Upland 6-10" p.z.
• Claysprings family, Breaks 6-10" p.z.

Component Descriptions

Marcou family soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents
Landform: Dunes on fan terraces
Parent material: Eolian material and fan alluvium derived from sandstone
Slope: 1 to 3 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.4 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Floodng hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 5 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB219AZ
Present vegetation: Indian ricegrass, galleta, Sporobolus, blue grama, fourwing saltbush, winterfat, Cutler Mormon tea
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 2 inches; fine sandy loam
C1—2 to 5 inches; fine sandy loam
C2—5 to 18 inches; fine sandy loam
C3—18 to 22 inches; fine sandy loam
C4—22 to 48 inches; fine sandy loam
C5—48 to 65 inches; sandy clay loam
C6—65 to 80 inches; fine sandy loam

Burnswick soils
*Taxonomic Classification:* Fine-loamy, mixed, superactive, mesic Sodic Haplocambids

*Landform:* Fan terraces

*Parent material:* Eolian material and fan alluvium derived from interbedded sedimentary rock

*Slope:* 1 to 3 percent

*Drainage class:* Well drained

*Slowest permeability:* 0.2 to 0.6 in/hr (moderately slow)

*Available water capacity:* About 10.0 inches (high)

*Shrink-swell potential:* About 7.0 percent (high)

*Flooding hazard:* None

*Ponding hazard:* None

*Runoff class:* Low

*Hydrologic group:* B

*Calcium carbonate maximum:* About 5 percent

*Gypsum maximum:* None

*Salinity maximum:* About 4 dS/m (very slightly saline)

*Sodium adsorption ratio maximum:* About 30 (strongly sodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands

*Ecological site:* Clay Loam Upland 6-10” p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Ecological site ID:* R035XB203AZ

*Present vegetation:* alkali sacaton, galleta, Indian ricegrass, blue grama, fourwing saltbush, mound saltbush, sand dropseed, shadscale saltbush

*Land capability subclass (nonirrigated):* 7c

Typical Profile:
- A—0 to 2 inches; fine sandy loam
- Bw1—2 to 11 inches; sandy clay loam
- Bw2—11 to 22 inches; sandy clay loam
- Bkn1—22 to 30 inches; sandy clay loam
- Bkn2—30 to 54 inches; clay loam
- BCn—54 to 80 inches; sandy clay loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

59—Mentmore family, 1 to 8 percent slopes

*Map Unit Setting*

*Landform setting:* drainageways, fan terraces, valley sides

*Elevation:* 6,200 to 6,900 feet

*Mean annual precipitation:* 10 to 14 inches

*Mean annual air temperature:* 50 to 53 degrees F

*Frost-free period:* 120 to 150 days
Map Unit Composition

Mentmore family and similar soils: 90 percent
Minor components: 10 percent
• Gish family, Clay Loam Upland 10-14” p.z.

Component Descriptions

Mentmore family soils

*Taxonomic Classification:* Fine-loamy, mixed, superactive, mesic Ustic Haplargids
*Landform:* Drainageways on valley sides, fan terraces on valley sides
*Parent material:* Fan and stream alluvium derived from sandstone and shale
*Slope:* 1 to 8 percent
*Drainage class:* Well drained
*Slowest permeability:* 0.2 to 0.6 in/hr (moderately slow)
*Available water capacity:* About 10.7 inches (high)
*Shrink-swell potential:* About 5.0 percent (moderate)
*Flooding hazard:* None
*Ponding hazard:* None
*Runoff class:* High
*Hydrologic group:* B
*Calcium carbonate maximum:* About 10 percent
*Gypsum maximum:* About 2 percent
*Salinity maximum:* About 2 dS/m (nonsaline)
*Sodium adsorption ratio maximum:* About 2 (slightly sodic)
*Major Land Resource Area:* 35; Colorado Plateau
*Land Resource Unit:* 35-3AZ; Colorado Plateau Sagebrush-Grasslands
*Ecological site:* Loamy Upland 10-14” p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Ecological site ID:* R035XC313AZ
*Present vegetation:* western wheatgrass, blue grama, Indian ricegrass, Wyoming big sagebrush, bottlebrush squirreltail, fourwing saltbush, galleta, muttongrass, oneseed juniper
*Land capability subclass (nonirrigated):* 6c

Typical Profile:
A—0 to 2 inches; loam
Bt—2 to 10 inches; clay loam
Bk1—10 to 28 inches; loam
Bk2—28 to 38 inches; clay loam
Bk3—38 to 52 inches; clay loam
C—52 to 60 inches; fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

60—Mesa family, 1 to 4 percent slopes

Map Unit Setting

*Landform setting:* fan terraces, mesas
*Elevation:* 5,800 to 6,400 feet
*Mean annual precipitation:* 6 to 10 inches
*Mean annual air temperature:* 51 to 54 degrees F
*Frost-free period:* 130 to 160 days
Map Unit Composition

Mesa family and similar soils: 85 percent
Minor components: 15 percent
  • Redlands family, Loamy Upland 5-8" p.z.
  • Shiprock family, Sandy Loam Upland 5-8" p.z.

Component Descriptions

Mesa family soils
*Taxonomic Classification:* Fine-loamy, mixed, superactive, mesic Typic Calciargids
*Landform:* Summits of fan terraces, mesas
*Parent material:* Fan and slope alluvium
*Slope:* 1 to 4 percent
*Drainage class:* Well drained
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)
*Available water capacity:* About 6.2 inches (moderate)
*Shrink-swell potential:* About 1.0 percent (low)
*Flooding hazard:* None
*Ponding hazard:* None
*Runoff class:* Low
*Hydrologic group:* B
*Calcium carbonate maximum:* About 40 percent
*Gypsum maximum:* About 2 percent
*Salinity maximum:* About 2 dS/m (nonsaline)
*Sodium adsorption ratio maximum:* About 0 (nonsodic)
*Major Land Resource Area:* 35; Colorado Plateau
*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands
*Ecological site:* Loamy Upland 6-10" p.z.
 Other ecological sites may occur in this map unit and vary in extent between delineations.
*Ecological site ID:* R035XB210AZ
*Present vegetation:* galleta, Indian ricegrass, blue grama, bottlebrush squirreltail, fourwing saltbush, Sporobolus, winterfat
*Land capability subclass (nonirrigated):* 7c

Typical Profile:
  A—0 to 5 inches; fine sandy loam
  Bt—5 to 11 inches; gravelly sandy clay loam
  2Bk1—11 to 22 inches; very cobbly sandy loam
  2Bk2—22 to 40 inches; very cobbly fine sandy loam
  3C—40 to 60 inches; loamy fine sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

61—Milok-Pinavetes families complex, 1 to 12 percent slopes

Map Unit Setting

*Landform setting:* dunes, hills, plateaus
*Elevation:* 5,600 to 6,600 feet
*Mean annual precipitation:* 10 to 14 inches
*Mean annual air temperature:* 50 to 53 degrees F
*Frost-free period:* 120 to 150 days
Map Unit Composition

Milok family and similar soils: 50 percent
Pinavetes family and similar soils: 35 percent
Minor components: 15 percent
• Begay, Sandy Loam Upland 10-14” p.z.
• Soils that are moderately deep or shallow

Component Descriptions

Milok family soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids
Landform: Plateaus, hills
Parent material: Eolian deposits derived from sandstone and/or eolian deposits and slope alluvium derived from sandstone
Slope: 1 to 12 percent
Surface fragments: About 3 percent gravel
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 9.4 inches (high)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 35 percent
Gypsum maximum: About 1 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 5 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Sandy Loam Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC317AZ
Present vegetation: Indian ricegrass, needleandthread, blue grama, bottlebrush squirreltail, Colorado pinyon, Wyoming big sagebrush, Greene rabbitbrush, Utah juniper, sand dropseed
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 1 inch; loamy fine sand
Bw—1 inch to 12 inches; very fine sandy loam
Bk1—12 to 39 inches; very fine sandy loam
Bk2—39 to 49 inches; very fine sandy loam
Bk3—49 to 60 inches; very fine sandy loam

Pinavetes family soils
Taxonomic Classification: Mixed, mesic Ustic Torripsamments
Landform: Dunes on plateaus, dunes on hills
Parent material: Eolian deposits derived from sandstone
Slope: 1 to 12 percent
Drainage class: Excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 5.3 inches (low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: A
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Sandy Upland 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC315AZ
Present vegetation: needleandthread, Indian ricegrass, blue grama, sand sagebrush, Mormon tea, bottlebrush squirreltail, sand dropseed, sandhill muhly, Utah juniper
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; loamy fine sand
C1—2 to 15 inches; loamy fine sand
C2—15 to 32 inches; loamy fine sand
Ck—32 to 60 inches; loamy fine sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

62—Moenkopie-Monue complex, 3 to 15 percent slopes

Map Unit Setting

Landform setting: fan terraces, plateaus
Elevation: 5,500 to 6,400 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Moenkopie and similar soils: 55 percent
Monue and similar soils: 30 percent
Minor components: 15 percent
• Redlands, Clay Loam Upland 6-10” p.z.
• Claysprings family, Shale Upland 6-10” p.z.
• Sheppard, Sandy Upland 6-10” p.z.

Component Descriptions

Moenkopie soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic Lithic Torriorthents
Landform: Plateaus
Parent material: Slope alluvium derived from sandstone and shale and/or eolian material and fan alluvium derived from sandstone
Slope: 5 to 15 percent
Depth to restrictive feature: 5 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 1.6 inches (very low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandstone/Shale Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB215AZ
Present vegetation: galleta, black grama, Bigelow sagebrush, Indian ricegrass,
        Sporobolus, ephedra, blue grama, needleandthread, broom snakeweed, Greene rabbitbrush
Land capability subclass (nonirrigated): 7c

Typical Profile:
   A—0 to 4 inches; loamy fine sand
   C1—4 to 12 inches; fine sandy loam
   C2—12 to 13 inches; loamy fine sand
   R—13 to 23 inches; bedrock

Monue soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Typic
         Haplocambids
Landform: Fan terraces
Parent material: Eolian deposits derived from calcareous sandstone and/or slope
        alluvium derived from calcareous sandstone
Slope: 3 to 12 percent
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 7.0 inches (moderate)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB219AZ
Present vegetation: Indian ricegrass, galleta, blue grama, needleandthread, Cutler Mormon tea, fourwing saltbush, winterfat

Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 3 inches; loamy fine sand
Bw—3 to 10 inches; sandy loam
C1—10 to 13 inches; sandy loam
C2—13 to 31 inches; sandy loam
C3—31 to 55 inches; sandy loam
C4—55 to 80 inches; sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

63—Monue very fine sandy loam, 1 to 5 percent slopes

Map Unit Setting

Landform setting: fan terraces
Elevation: 5,600 to 6,100 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Monue and similar soils: 100 percent
Minor components: 0 percent

Component Descriptions

Monue soils

Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids
Landform: Fan terraces
Parent material: Eolian material and fan alluvium derived from sandstone
Slope: 1 to 5 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 7.4 inches (moderate)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 10 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB219AZ
Present vegetation: Indian ricegrass, blue grama, galleta, needleandthread, ephedra cutleri, fourwing saltbush, black grama, broom snakeweed

Land capability subclass (irrigated): 3e
Land capability subclass (nonirrigated): 7e

Typical Profile:
A—0 to 1 inch; very fine sandy loam
Bk1—1 inch to 46 inches; fine sandy loam
Bk2—46 to 84 inches; loamy fine sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

64—Monue-Bluechief complex, 1 to 4 percent slopes

Map Unit Setting

Landform setting: fan terraces
Elevation: 5,300 to 5,800 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Monue and similar soils: 60 percent
Bluechief and similar soils: 30 percent
Minor components: 10 percent
• Redlands, Loamy Upland 6-10" p.z.
• Somorent family, Shale Upland 6-10" p.z.
• Sheppard, Sandy Upland 6-10" p.z.

Component Descriptions

Monue soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids
Landform: Fan terraces
Parent material: Eolian material and fan alluvium derived from sandstone and/or eolian material and slope alluvium derived from sandstone
Slope: 1 to 3 percent
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 6.6 inches (moderate)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10" p.z.  
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB219AZ  
Present vegetation: Indian ricegrass, galleta, blue grama, needleandthread, Cutler Mormon tea, fourwing saltbush, winterfat

Land capability subclass (nonirrigated): 7c

Typical Profile:  
A—0 to 3 inches; fine sandy loam  
Bw1—3 to 13 inches; fine sandy loam  
Bw2—13 to 28 inches; sandy loam  
C1—28 to 44 inches; sandy loam  
C2—44 to 80 inches; loamy sand

Bluechief soils  
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocalcids  
Landform: Fan terraces  
Parent material: Sandy eolian deposits derived from calcareous sandstone and/or slope alluvium derived from calcareous sandstone  
Slope: 1 to 4 percent  
Depth to restrictive feature: 20 to 40 inches to bedrock, lithic  
Drainage class: Well drained  
Slowest permeability: 0.6 to 2.0 in/hr (moderate)  
Available water capacity: About 4.1 inches (low)  
Shrink-swell potential: About 2.0 percent (low)  
Flooding hazard: None  
Ponding hazard: None  
Runoff class: Medium  
Hydrologic group: C  
Calcium carbonate maximum: About 40 percent  
Gypsum maximum: None  
Salinity maximum: About 2 dS/m (nonsaline)  
Sodium adsorption ratio maximum: About 2 (slightly sodic)

Major Land Resource Area: 35; Colorado Plateau  
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands  
Ecological site: Sandy Loam Upland 6-10" p.z. Calcareous

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB235AZ  
Present vegetation: Indian ricegrass, galleta, sand dropseed, shadscale saltbush, bottlebrush squirreltail, fourwing saltbush, winterfat, broom snakeweed

Land capability subclass (nonirrigated): 7c

Typical Profile:  
A—0 to 2 inches; fine sandy loam  
Bw—2 to 6 inches; fine sandy loam  
Bk1—6 to 14 inches; loam  
Bk2—14 to 28 inches; sandy loam  
Bk3—28 to 30 inches; gravelly sandy loam  
2R—30 to 40 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
65—Monue-Ives complex, 1 to 3 percent slopes

Map Unit Setting

*Landform setting:* alluvial fans, fan terraces  
*Elevation:* 5,800 to 6,500 feet  
*Mean annual precipitation:* 6 to 10 inches  
*Mean annual air temperature:* 51 to 54 degrees F  
*Frost-free period:* 130 to 160 days

Map Unit Composition

Monue and similar soils: 45 percent  
Ives and similar soils: 40 percent  
Minor components: 15 percent  
• Dunes  
• Redlands, Loamy Upland 6-10” p.z.  
• Jocity, occasionally flooded, Loamy Bottom 6-10” p.z.

Component Descriptions

**Monue soils**

*Taxonomic Classification:* Coarse-loamy, mixed, superactive, mesic Typic Haplocambids  
*Landform:* Fan terraces  
*Parent material:* Eolian material and fan alluvium derived from sandstone  
*Slope:* 1 to 3 percent  
*Drainage class:* Well drained  
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)  
*Available water capacity:* About 8.3 inches (moderate)  
*Shrink-swell potential:* About 1.0 percent (low)  
*Flooding hazard:* None  
*Ponding hazard:* None  
*Runoff class:* Very low  
*Hydrologic group:* B  
*Calcium carbonate maximum:* About 2 percent  
*Gypsum maximum:* None  
*Salinity maximum:* About 2 dS/m (nonsaline)  
*Sodium adsorption ratio maximum:* About 2 (slightly sodic)  
*Major Land Resource Area:* 35; Colorado Plateau  
*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands  
*Ecological site:* Sandy Loam Upland 6-10” p.z.  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
*Ecological site ID:* R035XB219AZ  
*Present vegetation:* Indian ricegrass, galleta, blue grama, needleandthread, Cutler Mormon tea, fourwing saltbush, winterfat  
*Land capability subclass (nonirrigated):* 7c

Typical Profile:

A—0 to 2 inches; fine sandy loam  
Bw—2 to 10 inches; fine sandy loam  
C1—10 to 18 inches; fine sandy loam  
C2—18 to 34 inches; fine sandy loam  
C3—34 to 72 inches; fine sandy loam
Ives soils

*Taxonomic Classification*: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torrifuvents

*Landform*: Alluvial fans

*Parent material*: Slope alluvium derived from calcareous sandstone

*Slope*: 1 to 3 percent

*Drainage class*: Somewhat excessively drained

*Slowest permeability*: 2.0 to 6.0 in/hr (moderately rapid)

*Available water capacity*: About 7.8 inches (moderate)

*Shrink-swell potential*: About 1.0 percent (low)

*Flooding hazard*: Occasional

*Ponding hazard*: None

*Runoff class*: Low

*Hydrologic group*: B

*Calcium carbonate maximum*: About 2 percent

*Gypsum maximum*: None

*Salinity maximum*: About 4 dS/m (very slightly saline)

*Sodium adsorption ratio maximum*: About 4 (slightly sodic)

**Major Land Resource Area**: 35; Colorado Plateau

**Land Resource Unit**: 35-2AZ; Colorado Plateau Shrub-Grasslands

**Ecological site**: Sandy Terrace 6-10” p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

**Ecological site ID**: R035XB222AZ

**Present vegetation**: Indian ricegrass, fourwing saltbush, galleta, blue grama, needleandthread, sand dropseed, western wheatgrass, broom snakeweed, winterfat, Greene rabbitbrush

**Land capability subclass (nonirrigated)**: 7c

*Typical Profile:*

A—0 to 3 inches; fine sandy loam

C1—3 to 8 inches; loamy sand

C2—8 to 18 inches; fine sandy loam

C3—18 to 40 inches; fine sandy loam

C4—40 to 55 inches; fine sandy loam

C5—55 to 62 inches; loamy sand

C6—62 to 71 inches; fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

### 66—Monue family, 2 to 12 percent slopes

**Map Unit Setting**

*Landform setting*: fan terraces

*Elevation*: 5,100 to 6,000 feet

*Mean annual precipitation*: 6 to 10 inches

*Mean annual air temperature*: 51 to 54 degrees F

*Frost-free period*: 130 to 160 days

**Map Unit Composition**

Monue family and similar soils: 75 percent
Minor components: 25 percent
- Monue family, Sandy Upland 6-10” p.z.
- Mesa family, Loamy Upland 5-8” p.z.
- Sheppard, Sandy Upland 6-10” p.z.

Component Descriptions

Monue family soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids
Landform: Fan terraces
Parent material: Eolian material and fan alluvium derived from sandstone
Slope: 2 to 12 percent
Drainage class: Somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 7.6 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 30 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB219AZ
Present vegetation: Indian ricegrass, blue grama, galleta, needleandthread, Cutler Mormon tea, black grama, fourwing saltbush
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 2 inches; loamy sand
Bw—2 to 10 inches; fine sandy loam
Bk1—10 to 20 inches; fine sandy loam
Bk2—20 to 39 inches; fine sandy loam
Bk3—39 to 56 inches; sandy loam
2Bk4—56 to 80 inches; loamy sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

67—Nakai-Monue very fine sandy loams, 1 to 5 percent slopes

Map Unit Setting

Landform setting: fan terraces
Elevation: 5,100 to 5,700 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Nakai and similar soils: 45 percent
Monue and similar soils: 40 percent
Minor components: 15 percent
• Sheppard, Sandy Upland 6-10" p.z.
• Tewa, Loamy Upland 6-10" p.z.

Component Descriptions

Nakai soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocalcids
Landform: Fan terraces
Parent material: Fan alluvium derived from sandstone and shale and/or eolian material and fan alluvium derived from sandstone
Slope: 1 to 5 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.6 inches (moderate)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 40 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 13 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB219AZ
Present vegetation: Indian ricegrass, blue grama, galleta, Cutler Mormon tea, bottlebrush squirreltail, fourwing saltbush, winterfat
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 3 inches; very fine sandy loam
Bk1—3 to 30 inches; fine sandy loam
Bk2—30 to 84 inches; sandy clay loam

Monue soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids
Landform: Fan terraces
Parent material: Eolian deposits derived from calcareous sandstone and/or slope alluvium derived from calcareous sandstone
Slope: 1 to 5 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.0 inches (moderate)
Shrink-swell potential: About 1.5 percent (low)
Soil Survey

Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB219AZ
Present vegetation: Indian ricegrass, blue grama, galleta, needleandthread, Cutler Mormon tea, fourwing saltbush
Land capability subclass (irrigated): 3e
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 1 inch; very fine sandy loam
Bw1—1 inch to 12 inches; sandy clay loam
Bw2—12 to 43 inches; fine sandy loam
Bk—43 to 55 inches; fine sandy loam
C—55 to 60 inches; sand
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

68—Narbona family-Deza complex, 5 to 50 percent slopes

Map Unit Setting

Landform setting: landslides, mountains
Elevation: 8,000 to 8,600 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 40 to 43 degrees F
Frost-free period: 80 to 110 days

Map Unit Composition

Narbona family and similar soils: 50 percent
Deza and similar soils: 40 percent
Minor components: 10 percent
• Rock outcrop
• Klizhin family, ponderosa pine forest
• Yahmore family, ponderosa pine forest
• Kunz, ponderosa pine forest

Component Descriptions

Narbona family soils
Taxonomic Classification: Loamy-skeletal, mixed, superactive, frigid Arenic Haplustalfs

Landform: Relic, stable landslides on mountains
Parent material: Colluvium derived from sandstone
Slope: 15 to 50 percent
Surface fragments: About 20 percent medium gravel, about 10 percent cobbles, about 5 percent stones
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 4.0 inches (low)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: A
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Pinus ponderosa/Quercus gambelii/Poa fendleriana-Carex geophila
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XH817AZ
Present vegetation: muttongrass, Gambel oak, mountain muhly, prairie junegrass, Arizona fescue, bottlebrush squirreltail, needleandthread, nodding brome, silvery lupine, Rocky Mountain juniper, creeping barberry
Land capability subclass (nonirrigated): 5c

Typical Profile:
A1—0 to 5 inches; cobbly loamy fine sand
A2—5 to 22 inches; very cobbly fine sand
Bt1—22 to 38 inches; very cobbly sandy loam
Bt2—38 to 55 inches; stony sandy clay loam
C—55 to 70 inches; stony loamy fine sand

Deza soils
Taxonomic Classification: Sandy, mixed, frigid Lamellic Haplustalfs
Landform: Relic, stable landslides on mountains
Parent material: Slope alluvium derived from sandstone
Slope: 5 to 15 percent
Surface fragments: About 2 percent gravel
Drainage class: Somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 4.4 inches (low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: A
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 1 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Pinus ponderosa/Quercus gambelii/Carex geophila-Lupinus argenteus

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: F035XH812AZ

Present vegetation: needleandthread, Gambel oak, bottlebrush squirreltail, mountain muhly, silvery lupine, Arizona fescue, prairie junegrass, creeping barberry

Land capability subclass (nonirrigated): 5c

Typical Profile:
- A—0 to 4 inches; fine sand
- E1—4 to 18 inches; fine sand
- E2—18 to 31 inches; fine sand
- E/Bt—31 to 65 inches; loamy fine sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

69—Navajo silty clay, saline-sodic, 1 to 3 percent slopes

Map Unit Setting

Landform setting: flood plains
Elevation: 4,800 to 5,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Navajo and similar soils: 80 percent
Minor components: 20 percent
- Burnswick, Clay Loam Upland 6-10" p.z.

Component Descriptions

Navajo soils
Taxonomic Classification: Fine, mixed, superactive, calcareous, mesic Vertic Torrifluvents
Landform: Flood plains
Parent material: Stream alluvium derived from sandstone and shale
Slope: 1 to 3 percent
Drainage class: Well drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 2.4 inches (very low)
Shrink-swell potential: About 7.5 percent (high)
Flooding hazard: Occasional
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 16 dS/m (moderately saline)
Sodium adsorption ratio maximum: About 13 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Loamy Wash 6-10" p.z. Saline
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB211AZ
Present vegetation: alkali sacaton, fourwing saltbush, galleta, mound saltbush, blue grama, bottlebrush squirreltail, western wheatgrass, black greasewood, shadscale saltbush
Land capability subclass (irrigated): 5w
Land capability subclass (nonirrigated): 7c

Typical Profile:
   A—0 to 5 inches; silty clay
   C—5 to 60 inches; stratified silty clay to clay

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

70—Norkiki family-Kimnoli complex, 1 to 8 percent slopes

Map Unit Setting

Landform setting: hills, mesas
Elevation: 6,000 to 6,800 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Norkiki family and similar soils: 45 percent
Kimnoli and similar soils: 40 percent
Minor components: 15 percent
• Rock outcrop
• Fajada, Loamy Upland 5-8" p.z. sodic

Component Descriptions

Norkiki family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Typic Haplargids
Landform: Summits of mesas, hills
Parent material: Eolian and slope alluvium derived from sandstone and shale
Slope: 1 to 8 percent
Depth to restrictive feature: 20 to 40 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 3.8 inches (low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: C
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 1 (slightly sodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands

Ecological site: Sandy Loam Upland 6-10" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB219AZ

Present vegetation: Indian ricegrass, galleta, Bigelow sagebrush, New Mexico feathergrass, alkali sacaton, blue grama, Mormon tea, Greene rabbitbrush, fourwing saltbush, shadscale saltbush

Land capability subclass (nonirrigated): 7c

Typical Profile:

A—0 to 3 inches; loamy fine sand
Bw—3 to 12 inches; loamy fine sand
Bt—12 to 20 inches; sandy clay loam
C—20 to 30 inches; gravelly fine sandy loam
R—30 to 40 inches; bedrock

Kimnoli soils

Taxonomic Classification: Loamy, mixed, superactive, mesic Lithic Haplargids

Landform: Summits of hills and mesas

Parent material: Eolian and slope alluvium derived from sandstone and shale

Slope: 1 to 8 percent

Depth to restrictive feature: 10 to 20 inches to bedrock, lithic

Drainage class: Well drained

Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 2.3 inches (very low)

Shrink-swell potential: About 1.0 percent (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: High

Hydrologic group: D

Calcium carbonate maximum: About 5 percent

Gypsum maximum: None

Salinity maximum: About 2 dS/m (nonsaline)

Sodium adsorption ratio maximum: About 1 (slightly sodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands

Ecological site: Sandstone/Shale Upland 6-10" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB215AZ

Present vegetation: Indian ricegrass, galleta, Bigelow sagebrush, black grama, blue grama, Mormon tea, fourwing saltbush

Land capability subclass (nonirrigated): 7s

Typical Profile:

A—0 to 2 inches; loamy fine sand
Bt—2 to 7 inches; fine sandy loam
Btk1—7 to 12 inches; fine sandy loam
Btk2—12 to 19 inches; fine sandy loam
R—19 to 29 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
71—Notal-Jolicy family complex, 0 to 2 percent slopes

Map Unit Setting

Landform setting: flood plains, stream terraces, valley floors
Elevation: 5,800 to 6,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Notal and similar soils: 50 percent
Jolicy family and similar soils: 40 percent
Minor components: 10 percent

Component Descriptions

Notal soils
Taxonomic Classification: Fine, mixed, active, calcareous, mesic Typic Torriorthents
Landform: Stream terraces on valley floors
Parent material: Stream alluvium derived from sandstone and shale
Slope: 0 to 2 percent
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity: About 9.4 inches (high)
Shrink-swell potential: About 7.0 percent (high)
Flooding hazard: Rare
Ponding hazard: None
Runoff class: High
Hydrologic group: C
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 2 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 13 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Clay Loam Terrace 6-10” p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB237AZ
Present vegetation: alkali sacaton, mound saltbush, galleta, black greasewood, bottlebrush squirreltail
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 3 inches; clay loam
C1—3 to 12 inches; clay
C2—12 to 25 inches; clay
Cy1—25 to 38 inches; clay
Cy2—38 to 45 inches; silty clay loam
Cy3—45 to 60 inches; clay

Jolicy family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents
Landform: Flood plains on valley floors
Parent material: Stream alluvium derived from sandstone and shale
Slope: 0 to 2 percent
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 9.9 inches (high)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: Occasional
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 2 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Loamy Wash 6-10" p.z. Saline
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB211AZ
Present vegetation: alkali sacaton, galleta, mound saltbush, Indian ricegrass, bottlebrush squirreltail, western wheatgrass, fourwing saltbush
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 4 inches; loam
Bw—4 to 9 inches; clay loam
C1—9 to 15 inches; sandy clay loam
C2—15 to 20 inches; clay loam
C3—20 to 27 inches; loam
C4—27 to 48 inches; fine sandy loam
C5—48 to 60 inches; silt loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

72—Notal-Notal family complex, 1 to 15 percent slopes

Map Unit Setting

Landform setting: dunes, stream terraces, valley floors
Elevation: 5,600 to 6,200 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Notal and similar soils: 60 percent
Notal family and similar soils: 30 percent
Minor components: 10 percent

Component Descriptions

Notal soils
Taxonomic Classification: Fine, mixed, active, calcareous, mesic Typic Torriorthents
Landform: Stream terraces on valley floors
Parent material: Stream alluvium derived from sandstone and shale
Slope: 1 to 3 percent
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity: About 9.1 inches (high)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: C
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 5 percent
Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 13 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Clay Loam Terrace 6-10” p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB237AZ
Present vegetation: alkali sacaton, mound saltbush, galleta, black greasewood, bottlebrush squirreltail, fourwing saltbush

Notal family soils
Taxonomic Classification: Fine, mixed, active, calcareous, mesic Typic Torriorthents
Landform: Parna dunes on stream terraces
Parent material: Eolian material from sandstone and clay
Slope: 3 to 15 percent
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity: About 5.2 inches (low)
Shrink-swell potential: About 5.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: B
Calcium carbonate maximum: About 2 percent
Gypsum maximum: About 2 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 13 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Clay Loam Terrace 6-10” p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB237AZ
Present vegetation: alkali sacaton, mound saltbush, galleta, black greasewood
Land capability subclass (nonirrigated): 7c

Typical Profile:
- **A**—0 to 2 inches; clay
- **C1**—2 to 7 inches; clay
- **C2**—7 to 19 inches; clay
- **C3**—19 to 28 inches; clay loam
- **2C4**—28 to 31 inches; clay

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

73—Notal-Trail-Riverwash association, 0 to 1 percent slopes

**Map Unit Setting**

*Landform setting:* flood plains, stream terraces  
*Elevation:* 5,500 to 6,200 feet  
*Mean annual precipitation:* 6 to 10 inches  
*Mean annual air temperature:* 51 to 54 degrees F  
*Frost-free period:* 130 to 160 days

**Map Unit Composition**

Notal and similar soils: 35 percent  
Trail and similar soils: 30 percent  
Riverwash: 25 percent  
Minor components: 10 percent  
- Bebeevar, frequently flooded, Sandy Bottom 5-8" p.z. Subirrigated

**Component Descriptions**

**Notal soils**

*Taxonomic Classification:* Fine, mixed, active, calcareous, mesic Typic Torriorthents  
*Landform:* Stream terraces  
*Parent material:* Steam alluvium derived from sandstone and shale  
*Slope:* 0 to 1 percent  
*Drainage class:* Well drained  
*Slowest permeability:* .06 to 0.2 in/hr (slow)  
*Available water capacity:* About 6.9 inches (moderate)  
*Shrink-swell potential:* About 4.5 percent (moderate)  
*Flooding hazard:* Rare  
*Ponding hazard:* None  
*Runoff class:* Very high  
*Hydrologic group:* D  
*Calcium carbonate maximum:* About 10 percent  
*Gypsum maximum:* About 5 percent  
*Salinity maximum:* About 16 dS/m (moderately saline)  
*Sodium adsorption ratio maximum:* About 30 (strongly sodic)  
*Major Land Resource Area:* 35; Colorado Plateau  
*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands  
*Ecological site:* Clay Loam Terrace 6-10" p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.

**Ecological site ID:** R035XB237AZ

**Present vegetation:** alkali sacaton, mound saltbush, galleta, black greasewood, bottlebrush squirreltail, fourwing saltbush

**Land capability subclass (irrigated):** 3s

**Land capability subclass (nonirrigated):** 7c

**Typical Profile:**
- A—0 to 3 inches; silty clay loam
- C1—3 to 11 inches; silty clay loam
- C2—11 to 70 inches; stratified sandy clay loam to silty clay

### Trail soils

**Taxonomic Classification:** Sandy, mixed, mesic Typic Torrifluvents

**Landform:** Flood plains

**Parent material:** Stream alluvium derived from sandstone and shale

**Slope:** 0 to 1 percent

**Drainage class:** Well drained

**Slowest permeability:** 0.6 to 2.0 in/hr (moderate)

**Available water capacity:** About 4.3 inches (low)

**Shrink-swell potential:** About 1.5 percent (low)

**Flooding hazard:** Occasional

**Ponding hazard:** None

**Seasonal high water table depth:** About 60 to 72 inches

**Runoff class:** Low

**Hydrologic group:** B

**Calcium carbonate maximum:** About 5 percent

**Gypsum maximum:** None

**Salinity maximum:** About 8 dS/m (slightly saline)

**Sodium adsorption ratio maximum:** About 5 (slightly sodic)

**Major Land Resource Area:** 35; Colorado Plateau

**Land Resource Unit:** 35-2AZ; Colorado Plateau Shrub-Grasslands

**Ecological site:** Sandy Wash 6-10" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

**Ecological site ID:** R035XB216AZ

**Present vegetation:** Indian ricegrass, alkali sacaton, western wheatgrass, fourwing saltbush, sand dropseed, bottlebrush squirreltail, broom snakeweed

**Land capability subclass (nonirrigated):** 6e

**Typical Profile:**
- A—0 to 2 inches; fine sandy loam
- C—2 to 70 inches; stratified sand to loamy fine sand

### Riverwash

**Parent material:** Alluvium from mixed sources

**Flooding hazard:** Frequent

**Ponding hazard:** None

**Major Land Resource Area:** 35; Colorado Plateau

Other ecological sites may occur in this map unit and vary in extent between delineations.

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
74—Parkelei family, 1 to 8 percent slopes

Map Unit Setting

Landform setting: mesas, plateaus
Elevation: 6,500 to 7,500 feet
Mean annual precipitation: 14 to 18 inches
Mean annual air temperature: 48 to 51 degrees F
Frost-free period: 110 to 140 days

Map Unit Composition

Parkelei family and similar soils: 90 percent
Minor components: 10 percent
• Evpark, pinyon-juniper forest
• Arabrab, pinyon-juniper forest
• Vessilla, pinyon-juniper forest

Component Descriptions

Parkelei family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Aridic Haplustalfs
Landform: Mesa summits, plateaus
Parent material: Eolian deposits and fan and slope alluvium derived from sandstone and shale
Slope: 1 to 8 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.8 inches (moderate)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Loamy Upland 13-17" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XF605AZ
Present vegetation: Wyoming big sagebrush, blue grama, western wheatgrass, Indian ricegrass, bottlebrush squirreltail, galleta, needleandthread, Greene rabbitbrush, broom snakeweed, Colorado pinyon, Utah juniper
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; sandy loam
BA—2 to 10 inches; sandy loam
Bt1—10 to 24 inches; sandy clay loam
Bt2—24 to 38 inches; sandy clay loam
Bk1—38 to 50 inches; sandy clay loam
Bk2—50 to 71 inches; sandy clay loam
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2C—71 to 80 inches; sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

75—Parkelei family-Arabrab complex, 2 to 8 percent slopes

Map Unit Setting

Landform setting: mesas, plateaus
Elevation: 6,400 to 7,400 feet
Mean annual precipitation: 14 to 18 inches
Mean annual air temperature: 48 to 51 degrees F
Frost-free period: 110 to 140 days

Map Unit Composition

Parkelei family and similar soils: 40 percent
Arabrab and similar soils: 35 percent
Minor components: 25 percent
• Fraguni, pinyon-juniper forestland
• Royosa, Sandy Upland 13-17” p.z.

Component Descriptions

Parkelei family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Aridic Haplustalfs
Landform: Summits of mesas and plateaus
Parent material: Eolian deposits and fan alluvium derived from sandstone and shale
Slope: 2 to 5 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 7.5 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp. wyomingensis-Purshia tridentata/Poa fendleriana-Achnatherum hymenoides
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XF628AZ
Present vegetation:
Common trees: oneseed juniper, twoneedle pinyon
Other plants: muttongrass, Wyoming big sagebrush, blue grama, Indian ricegrass, western wheatgrass, bottlebrush squirreltail, broom snakeweed, galleta, yucca, Gambel oak
**Land capability subclass (nonirrigated):** 6c

**Typical Profile:**
- A—0 to 3 inches; fine sandy loam
- Bt1—3 to 12 inches; sandy clay loam
- Bt2—12 to 27 inches; sandy clay loam
- Bk1—27 to 36 inches; sandy loam
- Bk2—36 to 48 inches; sandy loam
- Ck—48 to 80 inches; loamy sand

**Arabrab soils**

*Taxonomic Classification:* Loamy, mixed, superactive, mesic Lithic Haplustalfs

*Landform:* Summits of mesas and plateaus

*Parent material:* Eolian material and slope alluvium derived from sandstone and shale

*Slope:* 3 to 8 percent

*Depth to restrictive feature:* 10 to 20 inches to bedrock, lithic

*Drainage class:* Well drained

*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)

*Available water capacity:* About 2.7 inches (very low)

*Shrink-swell potential:* About 4.0 percent (moderate)

*Flooding hazard:* None

*Ponding hazard:* None

*Runoff class:* Medium

*Hydrologic group:* D

*Calcium carbonate maximum:* About 2 percent

*Gypsum maximum:* None

*Salinity maximum:* About 2 dS/m (nonsaline)

*Sodium adsorption ratio maximum:* About 0 (nonsodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush

*Ecological site:* Pinus edulis/Artemisia nova/Poa fendleriana

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Ecological site ID:* F035XF630AZ

**Present vegetation:**

- **Common trees:** oneseed juniper, twoneedle pinyon
- **Other plants:** muttongrass, Wyoming big sagebrush, blue grama, Eriogonum, Utah serviceberry, bottlebrush squirreltail, Gambel oak, Stansbury cliffrose

**Land capability subclass (nonirrigated):** 6c

**Typical Profile:**
- A—0 to 2 inches; loam
- Bt—2 to 11 inches; sandy clay loam
- Btk—11 to 18 inches; sandy clay loam
- R—18 to 28 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

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**76—Parkelei family-Evpark complex, 2 to 8 percent slopes**

**Map Unit Setting**

*Landform setting:* fan terraces, plateaus

*Elevation:* 6,700 to 7,500 feet
Mean annual precipitation: 14 to 18 inches
Mean annual air temperature: 48 to 51 degrees F
Frost-free period: 110 to 140 days

Map Unit Composition

Parkelei family and similar soils: 45 percent
Evpark and similar soils: 35 percent
Minor components: 20 percent
• Fraguni, pinyon-juniper forest
• Arabrab, pinyon-juniper forest

Component Descriptions

Parkelei family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Aridic Haplustalfs
Landform: Fan terraces on plateaus
Parent material: Eolian material and fan alluvium derived from sandstone and shale
Slope: 2 to 8 percent
Surface fragments: About 3 percent gravel
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.8 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp. wyomingensis-Pushia tridentata/Poa fendleri-Achnatherum hymenoides

Evpark soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Aridic Haplustalfs
Landform: Plateau summits
Parent material: Eolian material and slope alluvium derived from sandstone and shale
Slope: 2 to 8 percent
Depth to restrictive feature: 20 to 40 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 5.0 inches (low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: C
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp. wyomingensis-ephedra viridis/Poa fendleriana
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XF627AZ
Present vegetation:
Common trees: oneseed juniper, twoneedle pinyon
Other plants: muttongrass, Wyoming big sagebrush, blue grama, antelope bitterbrush, bottlebrush squirreltail, green Mormon tea, western wheatgrass, broom snakeweed
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 3 inches; fine sandy loam
Bt1—3 to 6 inches; fine sandy loam
Bt2—6 to 18 inches; sandy clay loam
Btk—18 to 35 inches; fine sandy loam
R—35 to 45 inches; bedrock
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

77—Parkelei family-Fraguni complex, 1 to 8 percent slopes

Map Unit Setting

Landform setting: plateaus
Elevation: 6,500 to 7,500 feet
Mean annual precipitation: 14 to 18 inches
Mean annual air temperature: 48 to 51 degrees F
Frost-free period: 110 to 140 days

Map Unit Composition

Parkelei family and similar soils: 45 percent
Fraguni and similar soils: 40 percent
Minor components: 15 percent
• Evpark, pinyon-juniper forest
Royosa, pinyon-juniper forest

Component Descriptions

Parkelei family soils

Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ardic Haplustalfs

Landform: Summits of plateaus

Parent material: Eolian material, fan and slope alluvium derived from sandstone and shale

Slope: 1 to 8 percent

Drainage class: Well drained

Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 8.8 inches (moderate)

Shrink-swell potential: About 2.0 percent (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Low

Hydrologic group: C

Calcium carbonate maximum: About 10 percent

Gypsum maximum: None

Salinity maximum: About 2 dS/m (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush

Ecological site: Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp. wyomingensis-Purshia tridentata/Poa fendleriana-Achnatherum hymenoides

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: F035XF628AZ

Present vegetation:

Common trees: one-seed juniper, two-needle pinyon

Other plants: Wyoming big sagebrush, muttongrass, Indian ricegrass, antelope bitterbrush, blue grama, bottlebrush squirreltail, galleta, western wheatgrass, broom snakeweed

Land capability subclass (nonirrigated): 6c

Typical Profile:

A—0 to 3 inches; loam

Bt—3 to 7 inches; loam

Btk—7 to 18 inches; clay loam

Bk1—18 to 28 inches; loam

Bk2—28 to 38 inches; sandy loam

Bk3—38 to 70 inches; sandy loam

Fraguni soils

Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Ardic Haplustalfs

Landform: Plateau summits

Parent material: Eolian material and slope alluvium derived from sandstone

Slope: 1 to 8 percent

Drainage class: Somewhat excessively drained

Slowest permeability: 0.6 to 2.0 in/hr (moderate)

Available water capacity: About 6.0 inches (moderate)

Shrink-swell potential: About 1.5 percent (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Juniperus monosperma-Pinus edulis/Artemisia tridentata ssp. wyomingensis/Achnatherum hymenoides-Hesperostipa comata comata
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XF622AZ
Present vegetation:
  Common trees: oneseed juniper, twoneedle pinyon
  Other plants: Indian ricegrass, antelope bitterbrush, Wyoming big sagebrush, blue grama, muttongrass, bottlebrush squirreltail, needleandthread, sand dropseed, sand sagebrush, Fremont barberry, rubber rabbitbrush
Land capability subclass (nonirrigated): 6c

Typical Profile:
  A—0 to 2 inches; loamy fine sand
  Bt—2 to 14 inches; sandy loam
  BC1—14 to 30 inches; loamy fine sand
  BC2—30 to 38 inches; fine sandy loam
  BC3—38 to 45 inches; sandy clay loam
  Bk—45 to 60 inches; sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

78—Parkelei family-Hosta complex, 3 to 8 percent slopes

Map Unit Setting

  Landform setting: drainageways, stream terraces
  Elevation: 6,900 to 7,500 feet
  Mean annual precipitation: 14 to 18 inches
  Mean annual air temperature: 48 to 51 degrees F
  Frost-free period: 110 to 140 days

Map Unit Composition

  Parkelei family and similar soils: 50 percent
  Hosta and similar soils: 40 percent
  Minor components: 10 percent
  - Evpark, pinyon-juniper forest
  - Arabrab, pinyon-juniper forest
  - Fraguni, pinyon-juniper forest

Component Descriptions

Parkelei family soils
  Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Aridic Haplustalfs
  Landform: Drainageways
  Parent material: Stream alluvium derived from sandstone and shale and/or eolian deposits and fan alluvium derived from sandstone and shale
Slope: 3 to 8 percent
Surface fragments: About 3 percent gravel
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.8 inches (moderate)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Loamy Upland 13-17" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XF605AZ

Present vegetation: Wyoming big sagebrush, Poa, bottlebrush squirreltail, western wheatgrass, galleta, broom snakeweed, needleandthread

Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 3 inches; fine sandy loam
Bt—3 to 13 inches; sandy clay loam
Btk1—13 to 21 inches; sandy clay loam
Btk2—21 to 43 inches; sandy clay loam
Btk3—43 to 55 inches; sandy clay loam
Btk4—55 to 60 inches; sandy clay loam

Hosta soils
Taxonomic Classification: Fine, mixed, superactive, mesic Aridic Haplustalfs
Landform: Stream terraces, drainageways
Parent material: Stream alluvium derived from sandstone and shale
Slope: 3 to 8 percent
Drainage class: Well drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 9.6 inches (high)
Shrink-swell potential: About 8.0 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: C
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Loamy Upland 13-17" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XF605AZ
Present vegetation: blue grama, Wyoming big sagebrush, bottlebrush squirreltail, muttongrass, western wheatgrass, galleta, broom snakeweed, needleandthread

Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 8 inches; clay loam
- Bt—8 to 15 inches; clay loam
- Btk1—15 to 22 inches; clay
- Btk2—22 to 33 inches; clay
- Btk3—33 to 46 inches; clay
- C—46 to 60 inches; clay

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

79—Penistaja family-Begay complex, 1 to 8 percent slopes

Map Unit Setting

Landform setting: fan terraces, plateaus
Elevation: 5,900 to 6,800 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Penistaja family and similar soils: 45 percent
Begay and similar soils: 40 percent
Minor components: 15 percent

Component Descriptions

Penistaja family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Haplargids
Landform: Fan terraces on plateaus
Parent material: Eolian deposits and fan and slope alluvium derived from sandstone and shale and/or eolian deposits and fan alluvium derived from sandstone
Slope: 1 to 8 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.7 inches (moderate)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 5 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Sandy Loam Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA117AZ
Present vegetation: Indian ricegrass, needleandthread, blue grama, galleta, ephedra cutleri, bottlebrush squirreltail, Wyoming big sagebrush, Ericameria nauseosa ssp. nauseosa var. glabrata, Utah juniper, twoneedle pinyon
Land capability subclass (nonirrigated): 6e
Typical Profile:
   A—0 to 2 inches; fine sandy loam
   Bt—2 to 18 inches; sandy clay loam
   Btk—18 to 58 inches; fine sandy loam
   Bk—58 to 84 inches; gravelly loamy sand

Begay soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
Landform: Fan terraces on plateaus
Parent material: Eolian deposits and fan alluvium derived from sandstone
Slope: 1 to 8 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.2 inches (moderate)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Sandy Loam Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA117AZ
Present vegetation: Indian ricegrass, needleandthread, blue grama, ephedra cutleri, bottlebrush squirreltail, galleta, Wyoming big sagebrush, Greene rabbitbrush, Utah juniper, twoneedle pinyon
Land capability subclass (irrigated): 3e
Land capability subclass (nonirrigated): 6e
Typical Profile:
   A—0 to 4 inches; very fine sandy loam
   Bk1—4 to 57 inches; very fine sandy loam
   Bk2—57 to 84 inches; loamy fine sand
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
80—Penistaja family-Betonnie complex, 1 to 10 percent slopes

Map Unit Setting

*Landform setting:* fan terraces  
*Elevation:* 6,000 to 6,600 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Mean annual air temperature:* 50 to 53 degrees F  
*Frost-free period:* 120 to 150 days

Map Unit Composition

Penistaja family and similar soils: 55 percent  
Betonnie and similar soils: 35 percent  
Minor components: 10 percent

Component Descriptions

**Penistaja family soils**

*Taxonomic Classification:* Fine-loamy, mixed, superactive, mesic Ustic Haplargids  
*Landform:* Fan terraces  
*Parent material:* Eolian deposits and fan alluvium derived from sandstone and/or eolian deposits and fan alluvium derived from sandstone and shale  
*Slope:* 1 to 10 percent  
*Drainage class:* Well drained  
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)  
*Available water capacity:* About 8.8 inches (moderate)  
*Shrink-swell potential:* About 4.5 percent (moderate)  
*Flood hazard:* None  
*Ponding hazard:* None  
*Runoff class:* Low  
*Hydrologic group:* B  
*Calcium carbonate maximum:* About 5 percent  
*Gypsum maximum:* None  
*Salinity maximum:* About 2 dS/m (nonsaline)  
*Sodium adsorption ratio maximum:* About 0 (nonsodic)  
*Major Land Resource Area:* 35; Colorado Plateau  
*Land Resource Unit:* 35-1AZ; Colorado Plateau Mixed Grass Plains  
*Ecological site:* Loamy Upland 10-14" p.z.  
*Other ecological sites may occur in this map unit and vary in extent between delineations.*  
*Ecological site ID:* R035XA113AZ  
*Present vegetation:* blue grama, Indian ricegrass, black grama, galleta, banana yucca, bottlebrush squirreltail, fourwing saltbush, sand dropseed, winterfat, Utah juniper  
*Land capability subclass (nonirrigated):* 6c

Typical Profile:

A—0 to 2 inches; fine sandy loam  
Bt1—2 to 10 inches; sandy clay loam  
Bt2—10 to 21 inches; sandy clay loam  
Bk1—21 to 41 inches; sandy clay loam  
Bk2—41 to 48 inches; sandy clay loam  
Bk3—48 to 59 inches; sandy clay loam  
C—59 to 80 inches; fine sandy loam
Bettonnie soils

*Taxonomic Classification:* Coarse-loamy, mixed, superactive, mesic Ustic Haplargids

*Landform:* Fan terraces

*Parent material:* Eolian deposits and fan alluvium derived from sandstone

*Slope:* 1 to 10 percent

*Drainage class:* Somewhat excessively drained

*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)

*Available water capacity:* About 8.3 inches (moderate)

*Shrink-swell potential:* About 1.0 percent (low)

*Floodling hazard:* None

*Ponding hazard:* None

*Runoff class:* Very low

*Hydrologic group:* B

*Calcium carbonate maximum:* About 10 percent

*Gypsum maximum:* About 1 percent

*Salinity maximum:* About 2 dS/m (nonsaline)

*Sodium adsorption ratio maximum:* About 0 (nonsodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-1AZ; Colorado Plateau Mixed Grass Plains

*Ecological site:* Sandy Loam Upland 10-14” p.z.

*Other ecological sites may occur in this map unit and vary in extent between delineations.*

*Ecological site ID:* R035XA117AZ

*Present vegetation:* blue grama, Indian ricegrass, black grama, sand dropseed, fourwing saltbush, galleta, needleandthread, winterfat, Cutler Mormon tea, Greene rabbitbrush, Utah juniper

*Land capability subclass (nonirrigated):* 6c

Typical Profile:

A—0 to 3 inches; fine sandy loam

Bw—3 to 12 inches; fine sandy loam

Bt—12 to 24 inches; fine sandy loam

Bk1—24 to 36 inches; fine sandy loam

Bk2—36 to 60 inches; fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

81—Pinavetes family, 1 to 15 percent slopes

**Map Unit Setting**

*Landform setting:* dunes, hills, plateaus

*Elevation:* 5,800 to 6,900 feet

*Mean annual precipitation:* 10 to 14 inches

*Mean annual air temperature:* 50 to 53 degrees F

*Frost-free period:* 120 to 150 days

**Map Unit Composition**

Pinavetes family and similar soils: 90 percent

Minor components: 10 percent

• Begay, Sandy Loam Upland 10-14” p.z.

• Milok family, Sandy Loam Upland 10-14” p.z.

• Penistaja family, Loamy Upland 10-14” p.z.
Pinavetes family soils

**Taxonomic Classification:** Mixed, mesic Ustic Torripsamments

**Landform:** Dunes on plateaus, dunes on hills

**Parent material:** Eolian deposits derived from sandstone

**Slope:** 1 to 15 percent

**Drainage class:** Excessively drained

**Slowest permeability:** 6.0 to 20 in/hr (rapid)

**Available water capacity:** About 4.1 inches (low)

**Shrink-swell potential:** About 1.5 percent (low)

**Flooding hazard:** None

**Ponding hazard:** None

**Runoff class:** Very low

**Hydrologic group:** A

**Calcium carbonate maximum:** About 2 percent

**Gypsum maximum:** None

**Salinity maximum:** About 2 dS/m (nonsaline)

**Sodium adsorption ratio maximum:** About 0 (nonsodic)

**Major Land Resource Area:** 35; Colorado Plateau

**Land Resource Unit:** 35-3AZ; Colorado Plateau Sagebrush-Grasslands

**Ecological site:** Sandy Upland 10-14" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

**Ecological site ID:** R035XC315AZ

**Present vegetation:** needleandthread, Indian ricegrass, blue grama, sand sagebrush, Mormon tea, bottlebrush squirreltail, sand dropseed, sandhill muhly, Utah juniper

**Land capability subclass (irrigated):** 2e

**Land capability subclass (nonirrigated):** 6c

Typical Profile:

A—0 to 3 inches; fine sand

C—3 to 84 inches; fine sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

82—Pinavetes family-Arches complex, 8 to 60 percent slopes

**Map Unit Setting**

**Landform setting:** dunes, plateaus

**Elevation:** 6,000 to 6,600 feet

**Mean annual precipitation:** 10 to 14 inches

**Mean annual air temperature:** 50 to 53 degrees F

**Frost-free period:** 120 to 150 days

**Map Unit Composition**

Pinavetes family and similar soils: 45 percent

Arches and similar soils: 30 percent

Minor components: 25 percent

• Soils that are shallow and clay textured

• Rock outcrop

• Zia family, occasionally flooded, Loamy
• Penistaja family, Loamy Upland 10-14" p.z.

Component Descriptions

Pinavetes family soils

Taxonomic Classification: Mixed, mesic Ustic Torripsamments
Landform: Dunes on plateaus
Parent material: Eolian deposits derived from sandstone and/or eolian deposits and residuum weathered from sandstone
Slope: 8 to 30 percent
Drainage class: Excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 4.0 inches (low)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: A
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Juniperus osteosperma/Artemisia tridentata ssp. wyomingensis-Purshia stansburiana/Achnatherum hymenoides-Hesperostipa comata
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XC323AZ
Present vegetation: Indian ricegrass, needleandthread, Wyoming big sagebrush, blue grama, Mormon tea, galleta, sand dropseed, sand sagebrush, sandhill muhly
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; loamy fine sand
C1—2 to 16 inches; sand
C2—16 to 41 inches; sand
C3—41 to 45 inches; fine sandy loam
C4—45 to 55 inches; fine sandy loam
C5—55 to 80 inches; loamy sand

Arches soils

Taxonomic Classification: Mixed, mesic Lithic Torripsamments
Landform: Dunes on plateaus
Parent material: Eolian deposits and residuum weathered from sandstone
Slope: 15 to 60 percent
Depth to restrictive feature: 10 to 20 inches to bedrock, lithic
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity: About 0.8 inches (very low)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None  
Salinity maximum: About 0 dS/m (nonsaline)  
Sodium adsorption ratio maximum: About 0 (nonsodic)  
Major Land Resource Area: 35; Colorado Plateau  
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands  
Ecological site: Juniperus osteosperma/Artemisia bigelovii-Purshia stansburiana/Achnatherum hymenoides-Hesperostipa neomexicana  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
Ecological site ID: F035XC322AZ  
Present vegetation: Bigelow sagebrush, Indian ricegrass, blue grama, Mormon tea, Stansbury cliffrose, galleta, muttongrass, needleandthread, Wyoming big sagebrush  
Land capability subclass (nonirrigated): 6c  
Typical Profile:  
A—0 to 1 inch; loamy fine sand  
C1—1 inch to 5 inches; loamy sand  
C2—5 to 11 inches; loamy sand  
R—11 to 21 inches; bedrock  
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.  

83—Pinavetes family-Begay complex, 1 to 8 percent slopes  

Map Unit Setting  
Landform setting: dunes, fan terraces  
Elevation: 5,800 to 6,600 feet  
Mean annual precipitation: 10 to 14 inches  
Mean annual air temperature: 51 to 53 degrees F  
Frost-free period: 130 to 150 days  

Map Unit Composition  
Pinavetes family and similar soils: 50 percent  
Begay and similar soils: 35 percent  
Minor components: 15 percent  

Component Descriptions  
Pinavetes family soils  
Taxonomic Classification: Mixed, mesic Ustic Torripsamments  
Landform: Dunes on fan terraces  
Parent material: Eolian deposits derived from sandstone  
Slope: 1 to 8 percent  
Drainage class: Excessively drained  
Slowest permeability: 6.0 to 20 in/hr (rapid)  
Available water capacity: About 4.2 inches (low)  
Shrink-swell potential: About 1.5 percent (low)  
Flooding hazard: None  
Ponding hazard: None  
Runoff class: Very low  
Hydrologic group: A
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Sandy Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA118AZ
Present vegetation: needleandthread, Indian ricegrass, blue grama, sand sagebrush, ephedra cutleri, Utah juniper, bottlebrush squirreltail, buckwheat, dropseed, sandhill muhly, singleleaf pinyon
Land capability subclass (irrigated): 2e
Land capability subclass (nonirrigated): 7e

Typical Profile:
A—0 to 3 inches; loamy fine sand
C—3 to 84 inches; fine sand

Begay soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
Landform: Fan terraces
Parent material: Eolian deposits and fan alluvium derived from sandstone
Slope: 1 to 8 percent
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 6.7 inches (moderate)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrolc group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Sandy Loam Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA117AZ
Present vegetation: Indian ricegrass, needleandthread, blue grama, ephedra cutleri, bottlebrush squirreltail, galleta, Wyoming big sagebrush, Greene rabbitbrush, Utah juniper, twoneedle pinyon
Land capability subclass (irrigated): 3e
Land capability subclass (nonirrigated): 6e

Typical Profile:
A—0 to 14 inches; loamy sand
Bk—14 to 84 inches; fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
84—Pinavetes family-Begay complex, 10 to 60 percent slopes

Map Unit Setting

Landform setting: dunes, fan terraces
Elevation: 6,000 to 6,600 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Pinavetes family and similar soils: 50 percent
Begay and similar soils: 40 percent
Minor components: 10 percent
- Pinavetes family, Sandy Upland 10-14” p.z.
- Begay, Sandy Loam upland 10-14” p.z.

Component Descriptions

Pinavetes family soils
Taxonomic Classification: Mixed, mesic Ustic Torripsamments
Landform: Dunes on fan terraces
Parent material: Eolian deposits and fan alluvium derived from sandstone and/or eolian deposits derived from sandstone
Slope: 15 to 60 percent
Drainage class: Excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity: About 2.5 inches (very low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: A
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Juniperus osteosperma/Artemisia tridentata ssp. wyomingensis-Purshia stansburiana/Achnatherum hymenoides-Hesperostipa comata
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XC323AZ
Present vegetation: Indian ricegrass, needleandthread, galleta, Wyoming big sagebrush, black grama, blue grama, sand sagebrush, sandhill muhly, dune broom, sand dropseed
Land capability subclass (nonirrigated): 6c

Typical Profile:
C1—0 to 3 inches; loamy sand
C2—3 to 16 inches; fine sand
C3—16 to 19 inches; fine sand
C4—19 to 50 inches; fine sand
Fort Defiance Area, Arizona and New Mexico

Begay soils

Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Ustic
Haplocambids

Landform: Fan terraces

Parent material: Eolian material and fan alluvium derived from sandstone

Slope: 10 to 25 percent

Drainage class: Well drained

Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 5.9 inches (low)

Shrink-swell potential: About 1.5 percent (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Low

Hydrologic group: B

Calcium carbonate maximum: About 5 percent

Gypsum maximum: None

Salinity maximum: About 2 dS/m (nonsaline)

Sodium adsorption ratio maximum: About 2 (slightly sodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands

Ecological site: Juniperus osteosperma/Artemisia tridentata ssp. wyomingensis-Purshia stansburiana/Achnatherum hymenoides-Hesperostipa comata

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: F035XC323AZ

Present vegetation: Indian ricegrass, needleandthread, Mormon tea, Wyoming big sagebrush, sand dropseed, blue grama, galleta, sand sagebrush, sandhill muhly

Land capability subclass (nonirrigated): 6c

Typical Profile:

A—0 to 3 inches; fine sandy loam

Bw—3 to 17 inches; fine sandy loam

Bk—17 to 35 inches; fine sandy loam

Ck1—35 to 52 inches; fine sand

Ck2—52 to 80 inches; fine sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

85—Pits, coal mine

Map Unit Setting

Landform setting: plateaus

Map Unit Composition

Coal mine lands: 100 percent

Minor components: 0 percent

Component Descriptions

Coal mine lands

Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

86—Plumasano-Parkelei family complex, 1 to 15 percent slopes

Map Unit Setting

Landform setting: plateaus
Elevation: 6,800 to 7,400 feet
Mean annual precipitation: 14 to 18 inches
Mean annual air temperature: 48 to 51 degrees F
Frost-free period: 110 to 140 days

Map Unit Composition

Plumasano and similar soils: 40 percent
Parkelei family and similar soils: 35 percent
Minor components: 25 percent
• Royosa, Sandy Upland 13-17” p.z.
• Arabrab, pinyon-juniper forestland

Component Descriptions

Plumasano soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Aridic Haplustepts
Landform: Summits of plateaus
Parent material: Eolian deposits and fan alluvium derived from sandstone and shale
Slope: 5 to 15 percent
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 8.1 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 15 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 5 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp. wyomingensis-Pushia tridentata/Poa fendleriana-Achnatherum hymenoides
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XF628AZ

Present vegetation:
- **Common trees**: oneseed juniper, twoneedle pinyon
- **Other plants**: muttongrass, Indian ricegrass, Wyoming big sagebrush, blue grama, bottlebrush squirreltail, broom snakeweed, prairie junegrass, western wheatgrass, rabbitbrush

*Land capability subclass (nonirrigated): 6c*

Typical Profile:
- A—0 to 2 inches; loamy sand
- Bw—2 to 10 inches; sandy loam
- Bk1—10 to 28 inches; fine sandy loam
- Bk2—28 to 52 inches; fine sandy loam
- Bk3—52 to 80 inches; sandy clay loam

**Parkelei family soils**

*Taxonomic Classification*: Fine-loamy, mixed, superactive, mesic Aridic Haplustalfs

*Landform*: Summits of plateaus

*Parent material*: Eolian material and fan alluvium derived from sandstone and shale

*Slope*: 1 to 5 percent

*Drainage class*: Well drained

*Slowest permeability*: 0.6 to 2.0 in/hr (moderate)

*Available water capacity*: About 8.8 inches (moderate)

*Shrink-swell potential*: About 4.0 percent (moderate)

*Flooding hazard*: None

*Ponding hazard*: None

*Runoff class*: Low

*Hydrologic group*: B

*Calcium carbonate maximum*: About 10 percent

*Gypsum maximum*: None

*Salinity maximum*: About 2 dS/m (nonsaline)

*Sodium adsorption ratio maximum*: About 0 (nonsodic)

*Major Land Resource Area*: 35; Colorado Plateau

*Land Resource Unit*: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush

*Ecological site*: Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp. wyomingensis-Purshia tridentata/Poa fendleri-Achnatherum hymenoides

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: F035XF628AZ

Present vegetation:
- **Common trees**: oneseed juniper, twoneedle pinyon
- **Other plants**: muttongrass, Wyoming big sagebrush, blue grama, Indian ricegrass, western wheatgrass, bottlebrush squirreltail, broom snakeweed, galleta

*Land capability subclass (nonirrigated): 6c*

Typical Profile:
- A—0 to 2 inches; fine sandy loam
- Bt1—2 to 10 inches; sandy clay loam
- Bt2—10 to 30 inches; sandy clay loam
- Btk—30 to 65 inches; sandy clay loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
87—Plumasano-Rock outcrop complex, 15 to 40 percent slopes

Map Unit Setting

Landform setting: hills
Elevation: 7,000 to 7,500 feet
Mean annual precipitation: 14 to 18 inches
Mean annual air temperature: 48 to 51 degrees F
Frost-free period: 110 to 140 days

Map Unit Composition

Plumasano and similar soils: 45 percent
Rock outcrop: 40 percent
Minor components: 15 percent
• Fraguni, Sandy Upland 13-17” p.z.
• Royosa, Sandy Upland 13-17” p.z.

Component Descriptions

Plumasano soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Aridic Haplustepts
Landform: Sideslopes of hills
Parent material: Eolian material and slope alluvium derived from sandstone
Slope: 15 to 40 percent
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 7.8 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 14 percent
Gypsum maximum: About 1 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 5 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp. wyomingensis-Purshia tridentata/Poa fendleriana-Achnatherum hymenoides
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XF628AZ
Present vegetation: Indian ricegrass, muttongrass, blue grama, needleandthread,
Wyoming big sagebrush, antelope bitterbrush, bottlebrush squirreltail, sand dropseed, yucca
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 3 inches; fine sandy loam
Bw—3 to 24 inches; fine sandy loam
C1—24 to 50 inches; fine sandy loam
C2—50 to 60 inches; loamy sand
**Rock outcrop**  
*Flooding hazard:* None  
*Ponding hazard:* None  
*Major Land Resource Area:* 35; Colorado Plateau  
Other ecological sites may occur in this map unit and vary in extent between delineations.

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

### 88—Polacca clay loam, 0 to 3 percent slopes

#### Map Unit Setting

*Landform setting:* stream terraces  
*Elevation:* 5,100 to 6,000 feet  
*Mean annual precipitation:* 6 to 10 inches  
*Mean annual air temperature:* 51 to 54 degrees F  
*Frost-free period:* 130 to 160 days

#### Map Unit Composition

Polacca and similar soils: 95 percent  
Minor components: 5 percent  
- Ives, occasionally flooded, Sandy Bottom 6-10” p.z.
- Jocity, occasionally flooded, Loamy Bottom 6-10” p.z.
- Wepo, occasionally flooded, Clayey Bottom 6-10” p.z.
- Monue, Sandy Loam Upland 6-10” p.z.

#### Component Descriptions

**Polacca soils**  
*Taxonomic Classification:* Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Haplocambids  
*Landform:* Stream terraces  
*Parent material:* Stream alluvium derived from sandstone and shale  
*Slope:* 0 to 3 percent  
*Drainage class:* Well drained  
*Slowest permeability:* .06 to 0.2 in/hr (slow)  
*Available water capacity:* About 7.5 inches (moderate)  
*Shrink-swell potential:* About 1.5 percent (low)  
*Flooding hazard:* None  
*Ponding hazard:* None  
*Runoff class:* High  
*Hydrologic group:* C  
*Calcium carbonate maximum:* About 15 percent  
*Gypsum maximum:* None  
*Salinity maximum:* About 2 dS/m (nonsaline)  
*Sodium adsorption ratio maximum:* About 0 (nonsodic)  
*Major Land Resource Area:* 35; Colorado Plateau  
*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands  
*Ecological site:* Clayey Fan 6-10” p.z.  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
*Ecological site ID:* R035XB239AZ
Present vegetation: alkali sacaton, galleta, fourwing saltbush, bottlebrush squirreltail, western wheatgrass, winterfat

Land capability subclass (irrigated): 2s
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 3 inches; clay loam
Bw—3 to 33 inches; stratified sandy clay loam
C—33 to 84 inches; loamy sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

89—Querencia clay loam, 0 to 3 percent slopes

Map Unit Setting

Landform setting: fan terraces
Elevation: 6,200 to 6,500 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 51 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Querencia and similar soils: 100 percent
Minor components: 0 percent

Component Descriptions

Querencia soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocambids
Landform: Fan terraces
Parent material: Alluvium derived from sandstone and shale
Slope: 0 to 3 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 9.2 inches (high)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Loamy Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC313AZ
Present vegetation: western wheatgrass, fourwing saltbush, bottlebrush squirreltail, Indian ricegrass, sand dropseed, winterfat
Land capability subclass (nonirrigated): 6c

Typical Profile:
  A—0 to 1 inch; clay loam
  Bw—1 inch to 33 inches; sandy clay loam
  Bk—33 to 84 inches; fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

90—Querencia and Gish soils, 0 to 2 percent slopes

Map Unit Setting

Landform setting: stream terraces, valley floors
Elevation: 6,100 to 6,800 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Querencia and similar soils: 0 percent
Gish and similar soils: 0 percent
Minor components: 100 percent
  • Querencia, sodic, Salty Bottomland 10-14” p.z.
  • Gish, sodic, Salty Bottomland 10-14” p.z.

Component Descriptions

Querencia soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocambids
Landform: Stream terraces on valley floors
Parent material: Stream alluvium derived from sandstone and shale
Slope: 0 to 2 percent
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 11.8 inches (high)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: Rare
Ponding hazard: Rare
Runoff class: Medium
Hydrologic group: C
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 1 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 5 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Clay Loam Flat 10-14” p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC309AZ
Present vegetation: alkali sacaton, western wheatgrass, galleta, fourwing saltbush, Indian ricegrass, bottlebrush squirreltail, black greasewood
Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 2 inches; silt loam
- Bw—2 to 10 inches; clay loam
- C1—10 to 15 inches; clay loam
- C2—15 to 70 inches; clay loam

Gish soils

**Taxonomic Classification:** Fine, mixed, superactive, mesic Ustic Haplocambids

**Landform:** Stream terraces on valley floors

**Parent material:** Stream alluvium derived from sandstone and shale

**Slope:** 0 to 2 percent

**Drainage class:** Well drained

**Slowest permeability:** .06 to 0.2 in/hr (slow)

**Available water capacity:** About 10.5 inches (high)

**Shrink-swell potential:** About 1.0 percent (low)

**Flooding hazard:** Rare

**Ponding hazard:** Rare

**Runoff class:** High

**Hydrologic group:** C

**Calcium carbonate maximum:** About 10 percent

**Gypsum maximum:** About 10 percent

**Salinity maximum:** About 4 dS/m (very slightly saline)

**Sodium adsorption ratio maximum:** About 10 (slightly sodic)

**Major Land Resource Area:** 35; Colorado Plateau

**Land Resource Unit:** 35-3AZ; Colorado Plateau Sagebrush-Grasslands

**Ecological site:** Clay Loam Flat 10-14” p.z. Sodic

Other ecological sites may occur in this map unit and vary in extent between delineations.

**Ecological site ID:** R035X309AZ

**Present vegetation:** alkali sacaton, western wheatgrass, galleta, fourwing saltbush, Indian ricegrass, bottlebrush squirreltail, black greasewood

Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 4 inches; silt loam
- Bw—4 to 20 inches; silty clay loam
- Bk1—20 to 30 inches; silty clay loam
- Bk2—30 to 35 inches; silty clay loam
- Bky—35 to 47 inches; silty clay loam
- C—47 to 70 inches; fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

91—Razito-Shiprock family complex, 3 to 8 percent slopes

Map Unit Setting

**Landform setting:** dunes, fan terraces

**Elevation:** 5,800 to 6,500 feet

**Mean annual precipitation:** 6 to 10 inches

**Mean annual air temperature:** 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Razito and similar soils: 50 percent
Shiprock family and similar soils: 40 percent
Minor components: 10 percent
• Norkiki family, Sandy Loam Upland 5-8" p.z.

Component Descriptions

Razito soils
Taxonomic Classification: Mixed, mesic Typic Torripsamments
Landform: Dunes
Parent material: Eolian sands derived from sandstone
Slope: 3 to 8 percent
Drainage class: Excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 5.7 inches (low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: A
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB217AZ
Present vegetation: Indian ricegrass, Sporobolus, blue grama, broom snakeweed, galleta, Mormon tea, needleandthread, sandhill muhly, rabbitbrush
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 4 inches; loamy fine sand
C1—4 to 28 inches; loamy fine sand
C2—28 to 46 inches; loamy fine sand
2Bk—46 to 54 inches; fine sandy loam
2C—54 to 72 inches; loamy fine sand

Shiprock family soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Typic Haplargids
Landform: Fan terraces
Parent material: Eolian material and fan alluvium derived from sandstone and shale
Slope: 3 to 8 percent
Drainage class: Somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 8.0 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low  
Hydrologic group: B  
Calcium carbonate maximum: About 2 percent  
Gypsum maximum: None  
Salinity maximum: About 2 dS/m (nonsaline)  
Sodium adsorption ratio maximum: About 2 (slightly sodic)  
Major Land Resource Area: 35, Colorado Plateau  
Land Resource Unit: 35-2AZ, Colorado Plateau Shrub-Grasslands  
Ecological site: Sandy Loam Upland 6-10" p.z.  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
Ecological site ID: R035XB219AZ  
Present vegetation: Indian ricegrass, galleta, blue grama, Sporobolus, bottlebrush squirreltail, fourwing saltbush, winterfat  
Land capability subclass (nonirrigated): 7c  

Typical Profile:  
A—0 to 6 inches; loamy fine sand  
Bt—6 to 22 inches; fine sandy loam  
Bk—22 to 64 inches; fine sandy loam  
C—64 to 72 inches; loamy fine sand  

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

92—Redlands-Monue complex, 1 to 8 percent slopes

Map Unit Setting

Landform setting: fan terraces, stream terraces  
Elevation: 5,800 to 6,200 feet  
Mean annual precipitation: 6 to 10 inches  
Mean annual air temperature: 51 to 54 degrees F  
Frost-free period: 130 to 160 days

Map Unit Composition

Redlands and similar soils: 50 percent  
Monue and similar soils: 40 percent  
Minor components: 10 percent  
• Sheppard, Sandy Upland 6-10" p.z.

Component Descriptions

Redlands soils  
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Typic Haplargids  
Landform: Stream terraces, fan terraces  
Parent material: Eolian and fan alluvium derived from sandstone and/or stream and fan alluvium derived from sandstone and shale  
Slope: 2 to 8 percent  
Drainage class: Moderately well drained  
Slowest permeability: 0.6 to 2.0 in/hr (moderate)  
Available water capacity: About 8.3 inches (moderate)  
Shrink-swell potential: About 2.0 percent (low)  
Flooding hazard: None  
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Loamy Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB210AZ
Present vegetation: galleta, blue grama, fourwing saltbush, Indian ricegrass, bottlebrush squirreltail, broom snakeweed, sand dropseed, winterfat
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 2 inches; fine sandy loam
BA—2 to 9 inches; fine sandy loam
Bt1—9 to 17 inches; sandy clay loam
Bt2—17 to 28 inches; sandy clay loam
Btk—28 to 42 inches; sandy clay loam
Bk—42 to 55 inches; sandy loam
C—55 to 80 inches; sandy loam

Monue soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids
Landform: Fan terraces
Parent material: Eolian deposits derived from calcareous sandstone and/or slope alluvium derived from calcareous sandstone
Slope: 1 to 4 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 7.1 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB219AZ
Present vegetation: Indian ricegrass, galleta, blue grama, needleandthread, Cutler Mormon tea, fourwing saltbush, winterfat
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 3 inches; loamy fine sand
Bw—3 to 17 inches; fine sandy loam
C1—17 to 36 inches; fine sandy loam
C2—36 to 48 inches; loamy fine sand
C3—48 to 57 inches; loamy fine sand
C4—57 to 70 inches; sandy clay loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

**93—Redlands-Shiprock families complex, 1 to 8 percent slopes**

### Map Unit Setting

*Landform setting:* fan terraces, mesas  
*Elevation:* 5,800 to 6,400 feet  
*Mean annual precipitation:* 6 to 10 inches  
*Mean annual air temperature:* 51 to 54 degrees F  
*Frost-free period:* 130 to 160 days

### Map Unit Composition

Redlands family and similar soils: 45 percent  
Shiprock family and similar soils: 40 percent  
Minor components: 15 percent  
- Razito, Sandy Upland 5-8” p.z.  
- Norkiki family, Sandy Loam Upland 5-8” p.z.

### Component Descriptions

**Redlands family soils**

*Taxonomic Classification:* Fine-loamy, mixed, superactive, mesic Typic Haplargids  
*Landform:* Summits of fan terraces on mesas  
*Parent material:* Eolian material and fan alluvium derived from sandstone and shale  
*Slope:* 1 to 8 percent  
*Drainage class:* Well drained  
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)  
*Available water capacity:* About 8.4 inches (moderate)  
*Shrink-swell potential:* About 1.0 percent (low)  
*Floodling hazard:* None  
*Ponding hazard:* None  
*Runoff class:* Low  
*Hydrologic group:* B  
*Calcium carbonate maximum:* About 5 percent  
*Gypsum maximum:* About 2 percent  
*Salinity maximum:* About 2 dS/m (nonsaline)  
*Sodium adsorption ratio maximum:* About 2 (slightly sodic)  
*Major Land Resource Area:* 35; Colorado Plateau  
*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands  
*Ecological site:* Loamy Upland 6-10” p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.  
*Ecological site ID:* R035XB210AZ  
*Present vegetation:* galleta, alkali sacaton, Indian ricegrass, blue grama, fourwing saltbush, black grama, bottlebrush squirreltail, broom snakeweeds, snakeweeds, Greene rabbitbrush
Land capability subclass (nonirrigated): 7c

Typical Profile:
- A—0 to 2 inches; fine sandy loam
- Bt—2 to 14 inches; sandy clay loam
- Btk—14 to 40 inches; fine sandy loam
- Bk—40 to 60 inches; fine sandy loam

Shiprock family soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Typic Haplargids
Landform: Summits of fan terraces on mesas
Parent material: Eolian material and fan alluvium derived from sandstone and shale
Slope: 1 to 8 percent
Drainage class: Somewhat excessively drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.3 inches (moderate)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 2 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB219AZ
Present vegetation: Indian ricegrass, galleta, blue grama, bottlebrush squirreltail, fourwing saltbush, winterfat

Land capability subclass (nonirrigated): 7c

Typical Profile:
- A—0 to 2 inches; loamy fine sand
- Bt1—2 to 14 inches; fine sandy loam
- Bt2—14 to 28 inches; fine sandy loam
- Btk—28 to 50 inches; sandy clay loam
- Bk—50 to 60 inches; fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

94—Redlands-Somorent family complex, 2 to 6 percent slopes

Map Unit Setting

Landform setting: fan terraces, hills
Elevation: 5,800 to 6,200 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days
Map Unit Composition

Redlands and similar soils: 55 percent
Somorent family and similar soils: 30 percent
Minor components: 15 percent
• Claysprings family, Shale Upland, 6-10" p.z.
• Monue, Sandy Loam Upland 6-10" p.z.
• Slick spots

Component Descriptions

Redlands soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Typic Haplargids
Landform: Fan terraces
Parent material: Fan alluvium derived from sandstone and shale
Slope: 2 to 4 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.9 inches (moderate)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 2 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 13 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Clay Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB203AZ
Present vegetation: alkali sacaton, galleta, fourwing saltbush, Indian ricegrass, blue grama, shadscale saltbush, winterfat, bottlebrush squirreltail, western wheatgrass
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 3 inches; sandy clay loam
BA—3 to 9 inches; sandy clay loam
Bt1—9 to 20 inches; sandy clay loam
Bt2—20 to 36 inches; sandy clay loam
Bt3—36 to 50 inches; sandy clay loam
2Bt—50 to 65 inches; sandy clay loam
2BC—65 to 80 inches; fine sandy loam

Somorent family soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic, shallow Typic Torriorthents
Landform: Hills
Parent material: Residuum weathered from shale
Slope: 3 to 6 percent
Surface fragments: About 5 percent gravel
Depth to restrictive feature: 6 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 1.3 inches (very low)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 5 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Shale Upland 6-10” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB220AZ
Present vegetation: alkali sacaton, galleta, shadscale saltbush, Indian ricegrass, Bigelow sagebrush, blue grama, broom snakeweed
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 1 inch; fine sandy loam
C—1 inch to 9 inches; sandy clay loam
Cr—9 to 60 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

95—Redlands-Whitecone complex, 1 to 3 percent slopes, eroded

Map Unit Setting
Landform setting: fan terraces
Elevation: 5,800 to 6,200 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition
Redlands and similar soils: 50 percent
Whitecone and similar soils: 35 percent
Minor components: 15 percent
• Monue, Sandy Loam Upland 6-10” p.z.
• Redlands, sodium-affected, Clayey Loam Upland 6-10” p.z.

Component Descriptions
Redlands soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Typic Haplargids
Landform: Fan terraces
Parent material: Fan alluvium derived from sandstone and shale
Slope: 2 to 3 percent
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 9.6 inches (high)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 5 percent
Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 13 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Clay Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB203AZ
Present vegetation: alkali sacaton, galleta, fourwing saltbush, Indian ricegrass, blue grama, shadscale saltbush, winterfat, bottlebrush squirreltail, western wheatgrass
Land capability subclass (nonirrigated): 7c
Typical Profile:
  A—0 to 4 inches; very fine sandy loam
  AB—4 to 9 inches; very fine sandy loam
  BA—9 to 18 inches; very fine sandy loam
  Bt1—18 to 25 inches; sandy clay loam
  Bt2—25 to 35 inches; clay loam
  2Btk1—35 to 40 inches; sandy clay loam
  2Btk2—40 to 47 inches; sandy clay loam
  2Btk3—47 to 60 inches; sandy clay loam
  2Btk4—60 to 70 inches; fine sandy loam

Whitecone soils
Taxonomic Classification: Fine, mixed, superactive, mesic Typic Natrargids
Landform: Fan terraces
Parent material: Fan alluvium derived from shale
Slope: 1 to 3 percent
Depth to restrictive feature: 40 to 60 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 9.4 inches (high)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: C
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 8 dS/m (slightly saline)
Sodium adsorption ratio maximum: About 30 (strongly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Clayey Upland 6-10” p.z. Sodic
Other ecological sites may occur in this map unit and vary in extent between
delineations.
Ecological site ID: R035XB225AZ
Present vegetation: galleta, alkali sacaton, mound saltbush, shadscale saltbush,
western wheatgrass, bottlebrush squirreltail, sand dropseed
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 1 inch; clay loam
Bt1—1 inch to 4 inches; clay
Bt2—4 to 10 inches; clay
Bt3—10 to 19 inches; clay
Bt4—19 to 28 inches; clay loam
Bt5—28 to 39 inches; clay loam
Bt6—39 to 54 inches; clay loam
Cr—54 to 60 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil
component and its Range in Characteristics.

96—Redlands-Whitecone complex, 1 to 4 percent slopes

Map Unit Setting

Landform setting: fan terraces
Elevation: 5,800 to 6,200 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Redlands and similar soils: 50 percent
Whitecone and similar soils: 35 percent
Minor components: 15 percent
  • Monue, Sandy Loam Upland 6-10” p.z.
  • Ives, occasionally flooded, Sandy Bottom 6-10” p.z.

Component Descriptions

Redlands soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Typic Haplargids
Landform: Fan terraces
Parent material: Fan alluvium derived from sandstone and shale
Slope: 1 to 4 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.5 inches (moderate)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 13 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Clay Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB203AZ

Present vegetation: alkali sacaton, galleta, fourwing saltbush, Indian ricegrass, blue grama, shadscale saltbush, winterfat, bottlebrush squirreltail, western wheatgrass

Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 2 inches; fine sandy loam
AB—2 to 13 inches; sandy loam
Btn—13 to 34 inches; sandy loam
Btkn1—34 to 51 inches; sandy clay loam
Btkn2—51 to 73 inches; sandy clay loam

Whitecone soils
Taxonomic Classification: Fine, mixed, superactive, mesic Typic Natrargids
Landform: Fan terraces
Parent material: Fan alluvium derived from shale
Slope: 1 to 3 percent
Drainage class: Well drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 9.0 inches (high)
Shrink-swell potential: About 7.0 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 10 percent
Gypsum maximum: About 2 percent
Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 20 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Clay Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB203AZ

Present vegetation: alkali sacaton, galleta, Indian ricegrass, blue grama, fourwing saltbush, shadscale saltbush, western wheatgrass, bottlebrush squirreltail, winterfat

Land capability subclass (nonirrigated): 7c

Typical Profile:
AB—0 to 3 inches; clay loam
Bt1—3 to 9 inches; clay
Bt2—9 to 17 inches; clay
Btn1—17 to 23 inches; clay
Btn2—23 to 29 inches; clay
Btn3—29 to 42 inches; clay
Btn4—42 to 60 inches; clay

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

97—Riverwash-Bebeevar association, 0 to 1 percent slopes

Map Unit Setting

*Landform setting:* flood plains, valley floors
*Elevation:* 5,500 to 6,200 feet
*Mean annual precipitation:* 10 to 14 inches
*Mean annual air temperature:* 50 to 53 degrees F
*Frost-free period:* 120 to 150 days

Map Unit Composition

Riverwash: 45 percent
Bebeevar and similar soils: 40 percent
Minor components: 15 percent
* Querencia, Clayey Fan 10-14” p.z.
* Trail, frequently flooded, Sandy Bottom 10-14” p.z.

Component Descriptions

Riverwash
*Parent material:* Alluvium from mixed sources
*Flooding hazard:* Frequent
*Ponding hazard:* None
*Major Land Resource Area:* 35; Colorado Plateau

Other ecological sites may occur in this map unit and vary in extent between delineations.

Bebeevar soils
*Taxonomic Classification:* Sandy, mixed, mesic Oxyaquic Torrifluvents
*Landform:* Flood plains on valley floors
*Parent material:* Stream alluvium derived from sandstone
*Slope:* 0 to 1 percent
*Drainage class:* Moderately well drained
*Slowest permeability:* 6.0 to 20 in/hr (rapid)
*Available water capacity:* About 3.4 inches (low)
*Shrink-swell potential:* About 1.0 percent (low)
*Flooding hazard:* Frequent
*Ponding hazard:* None
*Runoff class:* Very high
*Hydrologic group:* D
*Calcium carbonate maximum:* About 2 percent
*Gypsum maximum:* None
*Salinity maximum:* About 2 dS/m (nonsaline)
*Sodium adsorption ratio maximum:* About 2 (slightly sodic)
*Major Land Resource Area:* 35; Colorado Plateau
**Land Resource Unit:** 35-3AZ; Colorado Plateau Sagebrush-Grasslands  
**Ecological site:** Sandy Bottom 10-14" p.z. Subirrigated  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
**Ecological site ID:** R035XC358AZ  
**Present vegetation:** western wheatgrass, Indian ricegrass, bottlebrush squirreltail, common reed, sand dropseed, alkali sacaton, dropseed, fourwing saltbush, willow, Carex, Fremont cottonwood, rubber rabbitbrush, inland saltgrass  
**Land capability subclass (nonirrigated):** 6c  
**Typical Profile:**  
A—0 to 1 inch; loamy very fine sand  
C1—1 inch to 13 inches; loamy fine sand  
C2—13 to 20 inches; loamy fine sand  
C3—20 to 30 inches; fine sand  
C4—30 to 60 inches; fine sand  
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

**98—Riverwash-Typic Torrifluvents complex, 0 to 5 percent slopes**

**Map Unit Setting**  
**Landform setting:** flood plains, valley floors  
**Elevation:** 4,800 to 5,500 feet  
**Mean annual precipitation:** 6 to 10 inches  
**Mean annual air temperature:** 53 to 56 degrees F  
**Frost-free period:** 150 to 180 days

**Map Unit Composition**  
Riverwash: 50 percent  
Typic Torrifluvents and similar soils: 35 percent  
Minor components: 15 percent

**Component Descriptions**

**Riverwash**  
**Flooding hazard:** Frequent  
**Ponding hazard:** None  
**Seasonal high water table depth:** About 0 to 72 inches  
**Major Land Resource Area:** 35; Colorado Plateau  
Other ecological sites may occur in this map unit and vary in extent between delineations.  

**Typic Torrifluvents soils**  
**Taxonomic Classification:** Typic Torrifluvents  
**Landform:** Flood plains on valley floors  
**Slope:** 0 to 5 percent  
**Depth to restrictive feature:** 40 to 60 inches to bedrock, lithic  
**Drainage class:** Poorly drained  
**Flooding hazard:** Frequent  
**Ponding hazard:** None  
**Seasonal high water table depth:** About 12 to 72 inches  
**Runoff class:** Very low
Hydrologic group: B
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Loamy Wash 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB209AZ
Land capability subclass (nonirrigated): 7w

Typical Profile:
- C—0 to 60 inches; variable

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

99—Rizno-Tekapo family-Rock outcrop complex, 2 to 45 percent slopes

Map Unit Setting

Landform setting: escarpments, structural benches
Elevation: 6,000 to 6,700 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Rizno and similar soils: 40 percent
Tekapo family and similar soils: 30 percent
Rock outcrop: 25 percent
Minor components: 5 percent
- Rock outcrop
- Soils that are coarse textured and deep

Component Descriptions

Rizno soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Landform: Structural benches on escarpments
Parent material: Colluvium and slope alluvium over residuum weathered from sandstone and/or colluvium and slope alluvium over residuum weathered from limestone
Slope: 2 to 15 percent
Surface fragments: About 2 percent gravel
Depth to restrictive feature: 10 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 1.8 inches (very low)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Juniperus osteosperma/Artemisia bigelovii-Purshia stansburiana/
Achnatherum hymenoides-Hesperostipa neomexicana
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XC322AZ
Present vegetation: Indian ricegrass, Bigelow sagebrush, Stansbury cliffrose, blue
grama, Greene rabbitbrush, New Mexico feathergrass, galleta, muttongrass,
Wyoming big sagebrush, broom snakeweed
Land capability subclass (nonirrigated): 7e

Typical Profile:
A—0 to 2 inches; sandy loam
C—2 to 11 inches; loam
R—11 to 21 inches; bedrock

Tekapo family soils
Taxonomic Classification: Clayey, mixed, superactive, calcareous, mesic, shallow
Ustic Torriorthents
Landform: Escarpments
Parent material: Slope alluvium and colluvium over residuum weathered from shale
Slope: 2 to 45 percent
Surface fragments: About 1 percent gravel
Depth to restrictive feature: 10 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 2.4 inches (very low)
Shrink-swell potential: About 7.0 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Shale Hills 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC320AZ
Present vegetation: galleta, Indian ricegrass, alkali sacaton, shadscale saltbush,
Bigelow sagebrush, Eriogonum, bottlebrush squirreltail, Greene rabbitbrush, Utah
juniper
Land capability subclass (nonirrigated): 7e

Typical Profile:
A—0 to 2 inches; clay loam
C—2 to 12 inches; clay loam
Cr—12 to 60 inches; bedrock
Rock outcrop
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

100—Rock outcrop-Eagleye-Teesto family complex, 35 to 70 percent slopes

Map Unit Setting
Landform setting: hills
Elevation: 6,300 to 7,400 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition
Rock outcrop: 40 percent
Eagleye and similar soils: 30 percent
Teesto family and similar soils: 20 percent
Minor components: 10 percent
• Skyvillage, Shallow Loamy 10-14” p.z.

Component Descriptions

Rock outcrop
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.

Eagleye soils
Taxonomic Classification: Clayey, mixed, active, nonacid, mesic, shallow Ustic Torriorthents
Landform: Hills
Parent material: Colluvium and residuum weathered from sandstone and shale
Slope: 35 to 70 percent
Surface fragments: About 40 percent gravel
Depth to restrictive feature: 10 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 1.9 inches (very low)
Shrink-swell potential: About 7.5 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: None
Gypsum maximum: About 2 percent
Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 5 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Shale Hills 10-14” p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XC320AZ

Present vegetation: galleta, alkali sacaton, Indian ricegrass, shadscale saltbush, ephedra, Wyoming big sagebrush, bottlebrush squirreltail, Utah juniper, Bigelow sagebrush, Colorado pinyon

Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 3 inches; clay loam
C—3 to 12 inches; clay
Cr—12 to 60 inches; bedrock

Teesto family soils

Taxonomic Classification: Loamy-skeletal, mixed, superactive, calcareous, mesic
Lithic Ustic Torriorthents
Landform: Hills
Parent material: Colluvium and residuum weathered from sandstone
Slope: 35 to 50 percent
Surface fragments: About 40 percent gravel
Depth to restrictive feature: 5 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 0.8 inches (very low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D

Calcium carbonate maximum: About 1 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Sedimentary Cliffs 10-14” p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XC302AZ

Present vegetation: galleta, Wyoming big sagebrush, blue grama, Colorado pinyon, Indian ricegrass, Utah juniper, fourwing saltbush, muttongrass, Stansbury cliffrose

Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 3 inches; very channery fine sandy loam
C—3 to 10 inches; very channery fine sandy loam
R—10 to 20 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

101—Rock outcrop-Torriorthents complex, 5 to 60 percent slopes

Map Unit Setting

Landform setting: escarpments
Elevation: 5,800 to 6,800 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Rock outcrop: 50 percent
Torriorthents and similar soils: 40 percent
Minor components: 10 percent

Component Descriptions

Rock outcrop
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.

Torriorthents soils
Taxonomic Classification: Torriorthents
Landform: Structural bench escarpments
Slope: 5 to 60 percent
Depth to restrictive feature: 4 to 40 inches to bedrock, paralithic
Drainage class: Well drained
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Breaks 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA101AZ
Present vegetation: Bigelow sagebrush, muttongrass, Indian ricegrass, galleta, Stansbury cliffrose, Utah juniper, green Mormon tea, twoneedle pinyon, buckwheat

Land capability subclass (nonirrigated): 8e
Typical Profile:

A—0 to 20 inches; variable
Cr—20 to 60 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

102—Rock outcrop-Vessilla complex, 35 to 70 percent slopes

Map Unit Setting

Landform setting: escarpments
Elevation: 7,200 to 8,000 feet
Mean annual precipitation: 14 to 18 inches
Mean annual air temperature: 48 to 51 degrees F
Frost-free period: 110 to 140 days

Map Unit Composition

Rock outcrop: 70 percent
Vessilla and similar soils: 25 percent
Minor components: 5 percent
- Toldohn, pinyon-juniper forest
- Arabrab, pinyon-juniper forest
- Vessilla, 2 to 35 percent slopes

Component Descriptions

Rock outcrop
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.

Vessilla soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthents
Landform: Structural benches on escarpments
Parent material: Slope alluvium derived from sandstone
Slope: 35 to 70 percent
Depth to restrictive feature: 5 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 0.8 inches (very low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Fort Defiance Area, Arizona and New Mexico

Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush

Ecological site: Pinus edulis/Cercocarpus montanus-Purshia tridentata/Poa fendleriana-Achnatherum hymenoides

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: F035XF629AZ

Present vegetation:
- Common trees: oneseed juniper, twoneedle pinyon
- Other plants: muttongrass, Indian ricegrass, true mountainmahogany, Stansbury cliffrose, Wyoming big sagebrush, blue grama, bottlebrush squirreltail, green Mormon tea, Rocky Mountain juniper, black sagebrush

Land capability subclass (nonirrigated): 6c

Typical Profile:
- A—0 to 1 inch; gravelly fine sandy loam
- C—1 inch to 6 inches; very fine sandy loam
- R—6 to 16 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

103—Royosa loamy fine sand, 1 to 15 percent slopes

Map Unit Setting

Landform setting: dunes, fan terraces
Elevation: 6,400 to 7,000 feet
Mean annual precipitation: 14 to 18 inches
Mean annual air temperature: 48 to 51 degrees F
Frost-free period: 110 to 140 days

Map Unit Composition

Royosa and similar soils: 90 percent
Minor components: 10 percent
- Fraguni, pinyon-juniper forest
- Parkelei family, pinyon-juniper forest

Component Descriptions

Royosa soils

Taxonomic Classification: Mixed, mesic Aridic Ustipsamments
Landform: Dunes on fan terraces
Parent material: Eolian deposits derived from sandstone
Slope: 1 to 15 percent
Drainage class: Excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity: About 3.5 inches (low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: A
Calcium carbonate maximum: About 1 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Juniperus monosperma-Pinus edulis/Artemisia tridentata ssp.
wyomingensis/Achnatherum hymenoides-Hesperostipa comata ssp. comata
Other ecological sites may occur in this map unit and vary in extent between
delineations.
Ecological site ID: F035XF622AZ
Present vegetation: blue grama, Indian ricegrass, Wyoming big sagebrush,
neddleandthread, sand sagebrush, Sporobolus, antelope bitterbrush,
muttongrass, rubber rabbitbrush
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; loamy fine sand
C—2 to 60 inches; fine sand
See “Soil Series and Their Morphology” for a detailed description of the soil
component and its Range in Characteristics.

104—San Mateo-Wenota-Radnik complex, 0 to 3 percent
slopes

Map Unit Setting
Landform setting: flood plains, stream terraces, valley floors
Elevation: 5,800 to 7,200 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition
San Mateo and similar soils: 35 percent
Wenota and similar soils: 30 percent
Radnik and similar soils: 25 percent
Minor components: 10 percent
• Begay, Sandy Loam Upland 10-14” p.z.
• Zia, Sandy Loam Upland 10-14” p.z.

Component Descriptions
San Mateo soils
Taxonomic Classification: Fine-loamy, mixed, superactive, calcareous, mesic Ustic
Torrifluvents
Landform: Flood plains on valley floors
Parent material: Stream alluvium derived from shale and/or stream alluvium derived
from sandstone
Slope: 0 to 2 percent
Surface fragments: About 2 percent gravel
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 9.7 inches (high)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: Occasional  
Ponding hazard: None  
Runoff class: High  
Hydrologic group: D  
Calcium carbonate maximum: About 2 percent  
Gypsum maximum: None  
Salinity maximum: About 2 dS/m (nonsaline)  
Sodium adsorption ratio maximum: About 25 (moderately sodic)  
Major Land Resource Area: 35; Colorado Plateau  
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains  
Ecological site: Loamy Bottom 10-14" p.z.  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
Ecological site ID: R035XA112AZ  
Present vegetation: western wheatgrass, blue grama, galleta, Sporobolus, fourwing saltbush, bottlebrush squirreltail, Greene rabbitbrush, shadscale saltbush  
Land capability subclass (nonirrigated): 6c

Typical Profile:  
A—0 to 3 inches; sandy loam  
AC—3 to 8 inches; loam  
C1—8 to 24 inches; loam  
C2—24 to 37 inches; loam  
C3—37 to 57 inches; loam  
C4—57 to 80 inches; loamy sand

Wenota soils  
Taxonomic Classification: Fine, mixed, superactive, calcareous, mesic Ustic Torrifluvents  
Landform: Stream terraces on valley floors  
Parent material: Stream alluvium derived from clayey shale  
Slope: 1 to 3 percent  
Drainage class: Well drained  
Slowest permeability: .06 to 0.2 in/hr (slow)  
Available water capacity: About 8.9 inches (moderate)  
Shrink-swell potential: About 7.0 percent (high)  
Flooding hazard: Rare  
Ponding hazard: None  
Runoff class: High  
Hydrologic group: D  
Calcium carbonate maximum: About 5 percent  
Gypsum maximum: None  
Salinity maximum: About 2 dS/m (nonsaline)  
Sodium adsorption ratio maximum: About 0 (nonsodic)  
Major Land Resource Area: 35; Colorado Plateau  
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains  
Ecological site: Clayey Bottom 10-14" p.z.  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
Ecological site ID: R035XA104AZ  
Present vegetation: western wheatgrass, alkali sacaton, fourwing saltbush, galleta, blue grama, bottlebrush squirreltail, Greene rabbitbrush, pale wolfberry  
Land capability subclass (nonirrigated): 6c
Typical Profile:
   A—0 to 5 inches; clay
   C1—5 to 20 inches; clay
   C2—20 to 40 inches; clay
   C3—40 to 80 inches; clay

**Radnik soils**

*Taxonomic Classification:* Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torrifluvents

*Landform:* Flood plains

*Parent material:* Stream alluvium derived from calcareous sandstone

*Slope:* 0 to 2 percent

*Surface fragments:* About 5 percent gravel

*Drainage class:* Well drained

*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)

*Available water capacity:* About 6.4 inches (moderate)

*Shrink-swell potential:* About 1.0 percent (low)

*Flooding hazard:* Occasional

*Ponding hazard:* None

*Runoff class:* High

*Hydrologic group:* D

*Calcium carbonate maximum:* About 2 percent

*Gypsum maximum:* None

*Salinity maximum:* About 2 dS/m (nonsaline)

*Sodium adsorption ratio maximum:* About 0 (nonsodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-1AZ; Colorado Plateau Mixed Grass Plains

*Ecological site:* Loamy Bottom 10-14” p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Ecological site ID:* R035XA112AZ

*Present vegetation:* western wheatgrass, Indian ricegrass, fourwing saltbush, Greene rabbitbrush, blue grama, galleta, needleandthread, rubber rabbitbrush, sand dropseed

*Land capability subclass (nonirrigated):* 6c

Typical Profile:
   A—0 to 2 inches; sandy loam
   C1—2 to 14 inches; sandy loam
   C2—14 to 36 inches; sandy loam
   C3—36 to 46 inches; loamy sand
   C4—46 to 80 inches; loamy sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

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105—Sheppard loamy sand, 1 to 15 percent slopes

**Map Unit Setting**

*Landform setting:* dunes, fan terraces

*Elevation:* 5,000 to 5,700 feet

*Mean annual precipitation:* 6 to 10 inches

*Mean annual air temperature:* 51 to 54 degrees F

*Frost-free period:* 130 to 160 days
**Map Unit Composition**

Sheppard and similar soils: 80 percent
Minor components: 20 percent
- Jeddito, Loamy Terrace 5-8" p.z.
- Monue, Sandy Loam Upland 6-10" p.z.
- Nakai, Sandy Loam Upland 6-10" p.z.

**Component Descriptions**

**Sheppard soils**

*Taxonomic Classification:* Mixed, mesic Typic Torripsamments
*Landform:* Dunes on fan terraces
*Parent material:* Eolian sands derived from sandstone
*Slope:* 1 to 15 percent
*Drainage class:* Somewhat excessively drained
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)
*Available water capacity:* About 4.4 inches (low)
*Shrink-swell potential:* About 1.5 percent (low)
*Flooding hazard:* None
*Ponding hazard:* None
*Runoff class:* Very low
*Hydrologic group:* A
*Calcium carbonate maximum:* About 2 percent
*Gypsum maximum:* None
*Salinity maximum:* About 2 dS/m (nonsaline)
*Sodium adsorption ratio maximum:* About 0 (nonsodic)
*Major Land Resource Area:* 35; Colorado Plateau
*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands
*Ecological site:* Sandy Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
*Ecological site ID:* R035XB217AZ
*Present vegetation:* Indian ricegrass, galleta, needleandthread, sand dropseed, Cutler Mormon tea, blue grama, sand sagebrush, sandhill muhly
*Land capability subclass (nonirrigated):* 7c

**Typical Profile:**
- C1—0 to 7 inches; loamy sand
- C2—7 to 55 inches; loamy sand
- C3—55 to 68 inches; fine sandy loam
- 2Ck—68 to 75 inches; sandy clay loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

**106—Sheppard-Grieta family complex, 1 to 12 percent slopes**

**Map Unit Setting**

*Landform setting:* dunes, fan terraces, mesas, plateaus
*Elevation:* 4,800 to 5,500 feet
*Mean annual precipitation:* 6 to 10 inches
*Mean annual air temperature:* 53 to 56 degrees F
*Frost-free period:* 150 to 180 days
Map Unit Composition

Sheppard and similar soils: 45 percent
Grieta family and similar soils: 35 percent
Minor components: 20 percent

Component Descriptions

Sheppard soils
*Taxonomic Classification:* Mixed, mesic Typic Torripsamments
*Landform:* Dunes
*Parent material:* Eolian deposits derived from sandstone
*Slope:* 1 to 12 percent
*Drainage class:* Excessively drained
*Slowest permeability:* 6.0 to 20 in/hr (rapid)
*Available water capacity:* About 4.1 inches (low)
*Shrink-swell potential:* About 1.5 percent (low)
*Flooding hazard:* None
*Ponding hazard:* None
*Runoff class:* Low
*Hydrologic group:* A
*Calcium carbonate maximum:* About 2 percent
*Gypsum maximum:* None
*Salinity maximum:* About 0 dS/m (nonsaline)
*Sodium adsorption ratio maximum:* About 0 (nonsodic)
*Major Land Resource Area:* 35; Colorado Plateau
*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands
*Ecological site:* Sandy Upland 6-10" p.z.
*Ecological site ID:* R035XB217AZ
*Land capability subclass (nonirrigated):* 7e

Typical Profile:
- C—0 to 60 inches; loamy sand

Grieta family soils
*Taxonomic Classification:* Fine-loamy, mixed, superactive, mesic Typic Calciargids
*Landform:* Fan terraces on mesas and plateaus
*Parent material:* Eolian deposits
*Slope:* 1 to 12 percent
*Drainage class:* Well drained
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)
*Available water capacity:* About 8.0 inches (moderate)
*Shrink-swell potential:* About 2.0 percent (low)
*Flooding hazard:* None
*Ponding hazard:* None
*Runoff class:* Medium
*Hydrologic group:* B
*Calcium carbonate maximum:* About 30 percent
*Gypsum maximum:* None
*Salinity maximum:* About 2 dS/m (nonsaline)
*Sodium adsorption ratio maximum:* About 0 (nonsodic)
*Major Land Resource Area:* 35; Colorado Plateau
*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB219AZ
Land capability subclass (nonirrigated): 7e

Typical Profile:
A—0 to 3 inches; sandy loam
Bt—3 to 21 inches; sandy clay loam
Bk—21 to 60 inches; sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

107—Sheppard-Monue complex, 1 to 8 percent slopes

Map Unit Setting

Landform setting: dunes, fan terraces
Elevation: 5,800 to 6,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Sheppard and similar soils: 45 percent
Monue and similar soils: 40 percent
Minor components: 15 percent
• Dunes
• Redlands, Loamy Upland 6-10" p.z.
• Somorent family, Shale Upland 6-10" p.z.

Component Descriptions

Sheppard soils
Taxonomic Classification: Mixed, mesic Typic Torripsamments
Landform: Dunes
Parent material: Fan alluvium derived from calcareous sandstone and/or eolian deposits derived from calcareous sandstone
Slope: 3 to 8 percent
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity: About 5.3 inches (low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: A
Calcium carbonate maximum: About 1 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB217AZ

Present vegetation: Indian ricegrass, galleta, needleandthread, Cutler Mormon tea, blue grama, broom snakeweed, sandhill muhly, sand sagebrush, Eriogonum, rabbitbrush

Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 1 inch; loamy sand
C1—1 inch to 4 inches; loamy sand
C2—4 to 45 inches; sand
C3—45 to 80 inches; sand

Monue soils

Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids

Landform: Fan terraces

Parent material: Stream alluvium derived from calcareous sandstone and/or eolian deposits derived from calcareous sandstone

Slope: 1 to 6 percent

Drainage class: Well drained

Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 6.4 inches (moderate)

Shrink-swell potential: About 1.0 percent (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very low

Hydrologic group: B

Calcium carbonate maximum: About 2 percent

Gypsum maximum: None

Salinity maximum: About 2 dS/m (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands

Ecological site: Sandy Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB219AZ

Present vegetation: Indian ricegrass, galleta, blue grama, needleandthread, Cutler Mormon tea, fourwing saltbush, winterfat

Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 2 inches; loamy sand
Bw1—2 to 8 inches; fine sandy loam
Bw2—8 to 24 inches; fine sandy loam
C1—24 to 37 inches; loamy fine sand
C2—37 to 80 inches; loamy sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
108—Shiprock family-Farb-Rock outcrop complex, 3 to 8 percent slopes

Map Unit Setting

*Landform setting:* fan terraces, plateaus  
*Elevation:* 5,800 to 6,500 feet  
*Mean annual precipitation:* 6 to 10 inches  
*Mean annual air temperature:* 51 to 54 degrees F  
*Frost-free period:* 130 to 160 days

Map Unit Composition

Shiprock family and similar soils: 40 percent  
Farb and similar soils: 30 percent  
Rock outcrop: 20 percent  
Minor components: 10 percent  
• Huerfano, Loamy Upland 5-8” p.z. Sodic

Component Descriptions

**Shiprock family soils**  
*Taxonomic Classification:* Coarse-loamy, mixed, superactive, mesic Typic Haplargids  
*Landform:* Summits of fan terraces on plateaus  
*Parent material:* Eolian material and fan alluvium derived from sandstone and shale  
*Slope:* 3 to 8 percent  
*Drainage class:* Somewhat excessively drained  
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)  
*Available water capacity:* About 4.9 inches (low)  
*Shrink-swell potential:* About 1.0 percent (low)  
*Flood hazard:* None  
*Ponding hazard:* None  
*Runoff class:* Low  
*Hydrologic group:* B  
*Calcium carbonate maximum:* About 5 percent  
*Gypsum maximum:* About 1 percent  
*Salinity maximum:* About 2 dS/m (nonsaline)  
*Sodium adsorption ratio maximum:* About 2 (slightly sodic)  
*Major Land Resource Area:* 35; Colorado Plateau  
*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands  
*Ecological site:* Sandy Loam Upland 6-10” p.z.  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
*Ecological site ID:* R035XB219AZ  
*Present vegetation:* Indian ricegrass, galleta, blue grama, bottlebrush squirreltail, dropseed, fourwing saltbush, winterfat, snakeweed  
*Land capability subclass (nonirrigated):* 7c

Typical Profile:
  A—0 to 3 inches; loamy fine sand  
  Bt—3 to 13 inches; fine sandy loam  
  Btk—13 to 26 inches; fine sandy loam
C1—26 to 52 inches; sand
C2—52 to 80 inches; sand

**Farb soils**

*Taxonomic Classification:* Loamy, mixed, superactive, calcareous, mesic Lithic Torriorthents

*Landform:* Plateau dipslopes

*Parent material:* Slope alluvium over residuum weathered from sandstone

*Slope:* 3 to 8 percent

*Depth to restrictive feature:* 5 to 20 inches to bedrock, lithic

*Drainage class:* Well drained

*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)

*Available water capacity:* About 0.6 inches (very low)

*Shrink-swell potential:* About 1.0 percent (low)

*Flooding hazard:* None

*Ponding hazard:* None

*Slope:* 3 to 8 percent

*Hydrologic group:* D

*Calcium carbonate maximum:* About 5 percent

*Gypsum maximum:* None

*Salinity maximum:* About 2 dS/m (nonsaline)

*Sodium adsorption ratio maximum:* About 0 (nonsodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands

*Ecological site:* Sandstone/Shale Upland 6-10” p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Ecological site ID:* R035XB215AZ

*Present vegetation:* galleta, Indian ricegrass, Bigelow sagebrush, alkali sacaton, New Mexico feathergrass, blue grama, bottlebrush squirreltail, sagebrush, shadscale saltbush, Mormon tea

*Land capability subclass (nonirrigated):* 7s

Typical Profile:
- **A**—0 to 1 inch; gravelly loamy fine sand
- **C1**—1 inch to 4 inches; loamy fine sand
- **C2**—4 to 6 inches; fine sandy loam
- **R**—6 to 16 inches; bedrock

**Rock outcrop**

*Flooding hazard:* None

*Ponding hazard:* None

*Major Land Resource Area:* 35; Colorado Plateau

Other ecological sites may occur in this map unit and vary in extent between delineations.

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

**109—Skyvillage-Rock outcrop complex, 1 to 8 percent slopes**

*Map Unit Setting*

*Landform setting:* hills
Fort Defiance Area, Arizona and New Mexico

Elevation: 5,900 to 6,700 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 51 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Skyvillage and similar soils: 50 percent
Rock outcrop: 35 percent
Minor components: 15 percent

Component Descriptions

Skyvillage soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Landform: Hills
Parent material: Material weathered from sandstone and/or calcareous eolian sediments weathered from sandstone
Slope: 1 to 8 percent
Depth to restrictive feature: 6 to 17 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 1.0 inches (very low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Juniperus osteosperma/Artemisia bigelovii-Purshia stansburiana/
Achnatherum hymenoides-Hesperostipa neomexicana
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XC322AZ
Present vegetation: Bigelow sagebrush, Indian ricegrass, needleandthread, Stansbury cliffrose, Utah juniper, blue grama, galleta, twoneedle pinyon, bottlebrush squirreltail, thrifty goldenweed, Greene rabbitbrush
Land capability subclass (nonirrigated): 7e

Typical Profile:
A—0 to 1 inch; very fine sandy loam
C—1 inch to 7 inches; fine sandy loam
R—7 to 17 inches; bedrock

Rock outcrop
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

110—Skyvillage-Rock outcrop complex, 2 to 15 percent slopes

Map Unit Setting

Landform setting: mesas, plateaus
Elevation: 6,400 to 7,000 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 130 to 150 days

Map Unit Composition

Skyvillage and similar soils: 40 percent
Rock outcrop: 35 percent
Minor components: 25 percent
• Bond family, Shallow Loamy 10-14" p.z.
• Betonnie family, Sandy Loam Upland 10-14" p.z.

Component Descriptions

Skyvillage soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Landform: Summits of mesas and plateaus
Parent material: Eolian deposits and slope alluvium derived from sandstone
Slope: 2 to 15 percent
Depth to restrictive feature: 5 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 0.7 inches (very low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 20 percent
Gypsum maximum: None
Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Juniperus osteosperma/Artemisia bigelovii-Purshia stansburiana/
Achnatherum hymenoides-Hesperostipa neomexicana
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XC322AZ
Present vegetation:
  Common trees: oneseed juniper, twoneedle pinyon
  Other plants: New Mexico feathergrass, Bigelow sagebrush, Indian ricegrass,
  Greene rabbitbrush, Stansbury cliffrose, blue grama, muttongrass
Land capability subclass (nonirrigated): 6s

Typical Profile:
- A—0 to 1 inch; loamy fine sand
- C—1 inch to 5 inches; fine sandy loam
- R—5 to 15 inches; bedrock

Rock outcrop
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau

Other ecological sites may occur in this map unit and vary in extent between delineations.

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

111—Sogzie-Monue complex, 1 to 8 percent slopes

Map Unit Setting

Landform setting: fan terraces
Elevation: 5,800 to 6,200 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Sogzie and similar soils: 60 percent
Monue and similar soils: 30 percent
Minor components: 10 percent
  - Sheppard, Sandy Upland 6-10" p.z.
  - Jocity, occasionally flooded, Loamy Bottom 6-10" p.z.

Component Descriptions

Sogzie soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Typic Calciargids
Landform: Fan terraces
Parent material: Eolian material and fan alluvium derived from sandstone and siltstone and/or eolian deposits derived from calcareous sandstone
Slope: 1 to 4 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.5 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 15 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB219AZ
Present vegetation: Indian ricegrass, galleta, Sporobolus, needleandthread, Cutler Mormon tea, blue grama, fourwing saltbush, winterfat
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 3 inches; fine sandy loam
Bt1—3 to 10 inches; fine sandy loam
Bt2—10 to 16 inches; fine sandy loam
Btk—16 to 28 inches; fine sandy loam
Bk1—28 to 41 inches; fine sandy loam
Bk2—41 to 48 inches; loam
C—48 to 62 inches; fine sandy loam

Monue soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids
Landform: Fan terraces
Parent material: Eolian deposits derived from calcareous sandstone and/or slope alluvium derived from calcareous sandstone
Slope: 2 to 8 percent
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 6.7 inches (moderate)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB219AZ
Present vegetation: Indian ricegrass, galleta, blue grama, needleandthread, Cutler Mormon tea, fourwing saltbush, winterfat
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 3 inches; loamy fine sand
Bw1—3 to 10 inches; fine sandy loam
Bw2—10 to 30 inches; fine sandy loam
C1—30 to 55 inches; loamy fine sand
C2—55 to 80 inches; loamy fine sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
112—Somorent family-Moenkopie-Bluechief complex, 5 to 60 percent slopes

Map Unit Setting

Landform setting: fan terraces, hills, plateaus
Elevation: 5,300 to 5,800 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Somorent family and similar soils: 35 percent
Moenkopie and similar soils: 30 percent
Bluechief and similar soils: 20 percent
Minor components: 15 percent
• Redlands, Loamy Upland 6-10" p.z.
• Sheppard, Sandy Upland 6-10" p.z.

Component Descriptions

Somorent family soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic, shallow
Typic Torriorthents
Landform: Erosional remnants hills
Parent material: Slope alluvium derived from sandstone and shale and/or eolian material and slope alluvium over residuum weathered from sandstone and/or residuum weathered from shale
Slope: 15 to 60 percent
Surface fragments: About 5 percent gravel
Depth to restrictive feature: 5 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 1.6 inches (very low)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 13 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Mudstone/Sandstone Hills 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB201AZ
Present vegetation: galleta, Bigelow sagebrush, Indian ricegrass, alkali sacaton, black grama, blue grama, needleandthread, shadscale saltbush
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 3 inches; clay loam
C—3 to 8 inches; clay loam
Cr—8 to 60 inches; bedrock

**Moenkopie soils**

*Taxonomic Classification:* Loamy, mixed, superactive, calcareous, mesic Lithic Torriorthents

*Landform:* Plateaus

*Parent material:* Residuum weathered from sandstone and shale and/or slope alluvium derived from sandstone and shale

*Slope:* 8 to 15 percent

*Surface fragments:* About 15 percent gravel

*Depth to restrictive feature:* 5 to 20 inches to bedrock, lithic

*Drainage class:* Well drained

*Slowest permeability:* 0.2 to 0.6 in/hr (moderately slow)

*Available water capacity:* About 2.0 inches (very low)

*Shrink-swell potential:* About 5.0 percent (moderate)

*Flooding hazard:* None

*Ponding hazard:* None

*Runoff class:* High

*Hydrologic group:* D

*Calcium carbonate maximum:* About 5 percent

*Gypsum maximum:* None

*Salinity maximum:* About 2 dS/m (nonsaline)

*Sodium adsorption ratio maximum:* About 5 (slightly sodic)

*Major Land Resource Area:* 35; Colorado Plateau

*Land Resource Unit:* 35-2AZ; Colorado Plateau Shrub-Grasslands

*Ecological site:* Sandstone/Shale Upland 6-10” p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

*Ecological site ID:* R035XB215AZ

*Present vegetation:* galleta, black grama, Bigelow sagebrush, Indian ricegrass, Sporobolus, ephedra, blue grama, needleandthread

*Land capability subclass (nonirrigated):* 7c

Typical Profile:

A—0 to 2 inches; gravelly clay loam

C1—2 to 7 inches; gravelly clay loam

C2—7 to 10 inches; sandy clay loam

R—10 to 20 inches; bedrock

**Bluechief soils**

*Taxonomic Classification:* Coarse-loamy, mixed, superactive, mesic Typic Haplocalcids

*Landform:* Structural benches, fan terraces, plateaus

*Parent material:* Eolian deposits and/or residuum and/or slope alluvium

*Slope:* 5 to 10 percent

*Depth to restrictive feature:* 20 to 40 inches to bedrock, lithic

*Drainage class:* Well drained

*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)

*Available water capacity:* About 6.2 inches (moderate)

*Shrink-swell potential:* About 1.5 percent (low)

*Flooding hazard:* None

*Ponding hazard:* None

*Runoff class:* Medium

*Hydrologic group:* C

*Calcium carbonate maximum:* About 25 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Loam Upland 6-10* p.z. Calcareous
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB235AZ
Present vegetation: Indian ricegrass, galleta, sand dropseed, shadscale saltbush, bottlebrush squirreltail, fourwing saltbush, winterfat, broom snakeweed
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 2 inches; loam
Bw1—2 to 8 inches; loam
Bw2—8 to 18 inches; loam
Bk1—18 to 24 inches; loam
Bk2—24 to 30 inches; sandy loam
Bk3—30 to 38 inches; loam
R—38 to 48 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

113—Sonsela-Washpass family-Viewpoint complex, 20 to 70 percent slopes

Map Unit Setting
Landform setting: mountains
Elevation: 8,200 to 9,800 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 40 to 43 degrees F
Frost-free period: 80 to 110 days

Map Unit Composition
Sonsela and similar soils: 40 percent
Washpass family and similar soils: 25 percent
Viewpoint and similar soils: 20 percent
Minor components: 15 percent
• Owlspring
• Todacheen
• Rock outcrop

Component Descriptions

Sonsela soils
Taxonomic Classification: Loamy-skeletal, mixed, superactive, frigid Typic Haplustalfs
Landform: Mountains
Parent material: Colluvium derived from basalt
Slope: 35 to 70 percent
Surface fragments: About 25 percent stones, about 10 percent cobbles, about 5 percent gravel
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 4.3 inches (low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: B
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Pinus ponderosa/Quercus gambelii/Poa fendleriana-Carex geophila
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XH817AZ
Present vegetation: muttongrass, Gambel oak, bottlebrush squirreltail, Arizona fescue, Kentucky bluegrass, blue grama, mountain snowberry, nodding brome, creeping barberry
Land capability subclass (nonirrigated): 5c

Typical Profile:
A—0 to 3 inches; very stony loam
Bt1—3 to 12 inches; very stony loam
Bt2—12 to 22 inches; very cobbly sandy clay loam
Bt3—22 to 40 inches; very stony loam
Bt4—40 to 60 inches; very cobbly sandy loam

Washpass family soils
Taxonomic Classification: Coarse-loamy, mixed, superactive Ustic Argicryolls
Landform: Mountains
Parent material: Colluvium derived from basalt
Slope: 25 to 70 percent
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 10.3 inches (high)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Populus tremuloides-Pseudotsuga menziesii var. glauca/
Symphoricarpos oreophilus-Mahonia repens/Carex geophila
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XH825AZ

Present vegetation:
  Common trees: quaking aspen, corkbark fir, Douglas-fir
  Other plants: Kentucky bluegrass, mountain snowberry, nodding brome, Arizona fescue, Carex, bottlebrush squirreltail, creeping barberry, Gambel oak, currant

Land capability subclass (nonirrigated): 5c

Typical Profile:
  A—0 to 2 inches; loam
  Bt1—2 to 15 inches; loam
  Bt2—15 to 23 inches; loam
  Bt3—23 to 40 inches; sandy clay loam
  Bt4—40 to 60 inches; clay loam

Viewpoint soils

Taxonomic Classification: Loamy, mixed, superactive, frigid Lithic Argiustolls

Landform: Mountains

Parent material: Colluvium and residuum weathered from tuff breccia and/or colluvium and residuum weathered from basalt

Slope: 20 to 35 percent

Surface fragments: About 3 percent gravel

Depth to restrictive feature: 10 to 20 inches to bedrock, lithic

Drainage class: Well drained

Slowest permeability: 0.6 to 2.0 in/hr (moderate)

Available water capacity: About 1.9 inches (very low)

Shrink-swell potential: About 4.5 percent (moderate)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Hydrologic group: D

Calcium carbonate maximum: None

Gypsum maximum: None

Salinity maximum: About 2 dS/m (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests

Ecological site: Pinus ponderosa-Populus tremuloides/Symphoricarpos oreophilus/Carex geophila-Geranium

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: F035XH818AZ

Present vegetation: Arizona fescue, bottlebrush squirreltail, prairie junegrass, Gambel oak, Kentucky bluegrass, mountain snowberry, muttongrass, pingue rubberweed, rosy pussytoes, western yarrow

Land capability subclass (nonirrigated): 5c

Typical Profile:

Oi—0 to 1 inch; slightly decomposed plant material
  A—1 inch to 3 inches; loam
  Bt—3 to 12 inches; loam
  R—12 to 22 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
114—Sparank-San Mateo-Zia complex, 0 to 3 percent slopes

Map Unit Setting

*Landform setting:* flood plains, stream terraces, valley floors  
*Elevation:* 6,300 to 7,000 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Mean annual air temperature:* 50 to 52 degrees F  
*Frost-free period:* 120 to 150 days

Map Unit Composition

Sparank and similar soils: 40 percent  
San Mateo and similar soils: 35 percent  
Zia and similar soils: 20 percent  
Minor components: 5 percent  
• Doakum family, Loamy Upland 10-14” p.z.

Component Descriptions

**Sparank soils**

Description: This soil is a taxadjunct to the official series. It has a thick surface and is a coarse-loamy over clayey family. Use and management are not affected.  
**Taxonomic Classification:** Coarse-loamy over clayey, mixed, superactive, calcareous, mesic Ustic Torrifluvents  
**Landform:** Flood plains  
**Parent material:** Eolian deposits and stream alluvium derived from sandstone and/or stream alluvium derived from sandstone and shale  
**Slope:** 0 to 2 percent  
**Drainage class:** Well drained  
**Slowest permeability:** .06 to 0.2 in/hr (slow)  
**Available water capacity:** About 8.2 inches (moderate)  
**Shrink-swell potential:** About 4.0 percent (moderate)  
**Flooding hazard:** Occasional  
**Ponding hazard:** None  
**Runoff class:** High  
**Hydrologic group:** D  
**Calcium carbonate maximum:** About 2 percent  
**Gypsum maximum:** About 2 percent  
**Salinity maximum:** About 8 dS/m (slightly saline)  
**Sodium adsorption ratio maximum:** About 2 (slightly sodic)  
**Major Land Resource Area:** 35; Colorado Plateau  
**Land Resource Unit:** 35-1AZ; Colorado Plateau Mixed Grass Plains  
**Ecological site:** Clayey Bottom 10-14” p.z.  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
**Ecological site ID:** R035XA104AZ  
**Present vegetation:** western wheatgrass, galleta, alkali sacaton, blue grama, fourwing saltbush, broom snakeweed, sand dropseed  
**Land capability subclass (nonirrigated):** 6c

Typical Profile:

A—0 to 3 inches; loamy fine sand  
C1—3 to 16 inches; fine sandy loam
Fort Defiance Area, Arizona and New Mexico

C2—16 to 53 inches; silty clay
C3—53 to 80 inches; loamy fine sand

San Mateo soils
Taxonomic Classification: Fine-loamy, mixed, superactive, calcareous, mesic Ustic Torrifluvents
Landform: Valley floors, flood plains
Parent material: Stream alluvium from mixed sources
Slope: 0 to 2 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 9.0 inches (moderate)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: Occasional
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 25 (moderately sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Loamy Bottom 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA112AZ
Present vegetation: western wheatgrass, blue grama, bottlebrush squirreltail, fourwing saltbush, galleta, sand dropseed, winterfat
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; sandy clay loam
C1—2 to 10 inches; silt loam
C2—10 to 15 inches; sandy clay loam
C3—15 to 20 inches; loamy sand
C4—20 to 29 inches; silt loam
C5—29 to 36 inches; sandy clay loam
C6—36 to 40 inches; fine sandy loam
C7—40 to 46 inches; sandy clay loam
C8—46 to 65 inches; sandy loam

Zia soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torriorthents
Landform: Stream terraces on valley floors
Parent material: Eolian deposits and stream alluvium derived from sandstone
Slope: 1 to 3 percent
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 7.3 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Sandy Loam Upland 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA117AZ
Present vegetation: blue grama, Indian ricegrass, black grama, fourwing saltbush, sand dropseed, bottlebrush squirreltail, winterfat
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 3 inches; loamy fine sand
C1—3 to 15 inches; loamy fine sand
C2—15 to 25 inches; fine sandy loam
C3—25 to 30 inches; loamy fine sand
C4—30 to 70 inches; fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

115—Sponseller family-Cumulic Endoaquolls complex, 0 to 5 percent slopes

Map Unit Setting

Landform setting: fan terraces, flood plains, plateaus
Elevation: 7,500 to 8,200 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 40 to 43 degrees F
Frost-free period: 80 to 110 days

Map Unit Composition

Sponseller family and similar soils: 50 percent
Cumulic Endoaquolls and similar soils: 35 percent
Minor components: 15 percent
• Yahmore family, ponderosa pine forest
• Sandark family, ponderosa pine forest
• Klizhin family, ponderosa pine forest
• Kunz, ponderosa pine forest

Component Descriptions

Sponseller family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, frigid Typic Argiustolls
Landform: High elevation fan terraces on plateaus
Parent material: Fan alluvium derived from sandstone and shale
Slope: 0 to 5 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.3 inches (moderate)

Shrink-swell potential: About 1.5 percent (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very low

Hydrologic group: B

Calcium carbonate maximum: None

Gypsum maximum: None

Salinity maximum: About 2 dS/m (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests

Ecological site: Loamy Upland 17-25" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XH807AZ

Present vegetation: Arizona fescue, mountain muhly, blue grama, bottlebrush squirreltail, western wheatgrass, Wyoming big sagebrush, Gambel oak, pingue rubberweed, western yarrow

Land capability subclass (nonirrigated): 5c

Typical Profile:

A—0 to 12 inches; fine sandy loam

Bw—12 to 22 inches; fine sandy loam

Bt—22 to 30 inches; sandy clay loam

BC—30 to 60 inches; fine sandy loam

Cumulic Endoaquolls soils

Taxonomic Classification: Cumulic Endoaquolls

Landform: High elevation flood plains on plateaus

Parent material: Stream alluvium derived from sandstone and shale

Slope: 0 to 2 percent

Drainage class: Poorly drained

Slowest permeability: .06 to 0.2 in/hr (slow)

Available water capacity: About 10.8 inches (high)

Shrink-swell potential: About 4.5 percent (moderate)

Flooding hazard: Occasional

Ponding hazard: None

Seasonal high water table depth: About 12 to 24 inches

Runoff class: Medium

Hydrologic group: D

Calcium carbonate maximum: About 10 percent

Gypsum maximum: None

Salinity maximum: About 2 dS/m (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Major Land Resource Area: 35; Colorado Plateau

Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests

Ecological site: Meadow 17-25" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XH821AZ

Present vegetation: Carex, Kentucky bluegrass, tufted hairgrass, western wheatgrass, Baltic rush, mountain brome, redtop, willow, Woods rose, western yarrow

Land capability subclass (nonirrigated): 5c
Typical Profile:
A1—0 to 7 inches; silt loam
A2—7 to 39 inches; silty clay loam
C1—39 to 47 inches; clay
C2—47 to 60 inches; clay
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

116—Strych family-Rock outcrop complex, 25 to 60 percent slopes

Map Unit Setting

Landform setting: hills
Elevation: 5,800 to 6,700 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 51 to 53 degrees F
Frost-free period: 130 to 150 days

Map Unit Composition

Strych family and similar soils: 70 percent
Rock outcrop: 20 percent
Minor components: 10 percent

Component Descriptions

Strych family soils
Taxonomic Classification: Loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcids
Landform: Hills
Parent material: Fan alluvium and colluvium derived from conglomerate and/or fan alluvium and colluvium derived from sandstone and shale
Slope: 25 to 60 percent
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 3.2 inches (low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 30 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Breaks 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA101AZ
Present vegetation: Bigelow sagebrush, muttongrass, black grama, blue grama, galleta, desert needlegrass, green Mormon tea, Utah juniper
Land capability subclass (nonirrigated): 7e
Typical Profile:
A—0 to 2 inches; extremely cobbly fine sandy loam
Bk1—2 to 9 inches; very gravelly loam
Bk2—9 to 23 inches; very stony fine sandy loam
Bk3—23 to 60 inches; extremely stony fine sandy loam

Rock outcrop
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

117—Teesto very gravelly fine sandy loam, 5 to 35 percent slopes

Map Unit Setting

Landform setting: hills
Elevation: 6,200 to 6,700 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Teesto and similar soils: 85 percent
Minor components: 15 percent
• Strych family, Breaks 10-14” p.z.
• Flaco, Sandy Loam Upland 10
• Pinavetes family, Sandy Upland 10-14” p.z.

Component Descriptions

Teesto soils
Taxonomic Classification: Loamy-skeletal, mixed, superactive, calcareous, mesic
Lithic Ustic Torriorthents
Landform: Cinder cone hills
Parent material: Eolian material and colluvium and slope alluvium derived from
pyroclastic rock and/or eolian material, colluvium and slope alluvium derived from basalt
Slope: 5 to 35 percent
Surface fragments: About 40 percent gravel
Depth to restrictive feature: 6 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 0.8 inches (very low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Calcium carbonate maximum: About 5 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Shallow Loamy 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA119AZ
Present vegetation: New Mexico feathergrass, blue grama, Bigelow sagebrush, Indian ricegrass, Greene rabbitbrush, Stansbury cliffrose, Utah juniper, galleta, Mormon tea, broom snakeweed
Land capability subclass (nonirrigated): 6c
Typical Profile:
  A—0 to 3 inches; very gravelly fine sandy loam
  Bk—3 to 9 inches; very gravelly sandy loam
  R—9 to 19 inches; bedrock
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

118—Tesihim complex, 2 to 15 percent slopes

Map Unit Setting

Landform setting: buttes, mesas
Elevation: 6,200 to 6,600 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Tesihim and similar soils: 45 percent
Tesihim and similar soils: 40 percent
Minor components: 15 percent
  • Rock outcrop

Component Descriptions

Tesihim soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic, shallow
  Ustic Torriorthents
Landform: Buttes, mesas
Parent material: Eolian material and residuum derived from tuff
Slope: 3 to 15 percent
Surface fragments: About 40 percent gravel
Depth to restrictive feature: 0 to 20 inches to bedrock, paralithic
Drainage class: Somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 0.4 inches (very low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Volcanic Upland 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA108AZ
Present vegetation: blue grama, Bigelow sagebrush, Indian ricegrass, Stansbury cliffrose, New Mexico feathergrass, yucca, bottlebrush squirreltail, galleta, spineless horsebrush, Utah juniper, Colorado pinyon
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 1 inch; very gravelly sandy loam
C—1 inch to 4 inches; gravelly sandy loam
Cr—4 to 60 inches; bedrock

Tesihim soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents
Landform: Buttes, mesas
Parent material: Eolian material and slope alluvium derived from tuff
Slope: 2 to 8 percent
Surface fragments: About 95 percent gravel
Depth to restrictive feature: 10 to 20 inches to bedrock, paralithic
Drainage class: Somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 2.3 inches (very low)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Limestone Upland 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA123AZ
Present vegetation: blue grama, Bigelow sagebrush, Indian ricegrass, bottlebrush squirreltail, muttongrass, Greene rabbitbrush, Stansbury cliffrose, galleta, broom snakeweed
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 3 inches; sandy loam
AB—3 to 10 inches; sandy loam
Bw—10 to 19 inches; sandy loam
Cr—19 to 29 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

119—Tewa very fine sandy loam, 1 to 5 percent slopes

Map Unit Setting

Landform setting: fan terraces
Elevation: 5,100 to 5,700 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Tewa and similar soils: 80 percent
Minor components: 20 percent
• Jeddito, Loamy Terrace 5-8” p.z.
• Wepo, Clayey Bottom 6-10” p.z.
• Monue, Sandy Loam Upland 6-10” p.z.

Component Descriptions

Tewa soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Typic Haplocambids
Landform: Fan terraces
Parent material: Fan alluvium derived from sandstone and shale
Slope: 1 to 5 percent
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 9.4 inches (high)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: C
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 2 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Loamy Upland 6-10” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB210AZ
Present vegetation: galleta, Indian ricegrass, fourwing saltbush, alkali sacaton, blue grama, bottlebrush squirreltail, winterfat
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 2 inches; very fine sandy loam
Bw—2 to 15 inches; fine sandy loam
Bk1—15 to 25 inches; clay loam
Fort Defiance Area, Arizona and New Mexico

Bk2—25 to 36 inches; sandy loam
BC—36 to 60 inches; loam
2C—60 to 80 inches; sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

120—Toldohn-Vessilla-Rock outcrop complex, 8 to 35 percent slopes

Map Unit Setting

Landform setting: hills, ridges
Elevation: 6,900 to 7,500 feet
Mean annual precipitation: 14 to 18 inches
Mean annual air temperature: 48 to 51 degrees F
Frost-free period: 110 to 140 days

Map Unit Composition

Toldohn and similar soils: 35 percent
Vessilla and similar soils: 30 percent
Rock outcrop: 20 percent
Minor components: 15 percent
• Arabrab, pinyon-juniper forest
• Toldohn, slopes greater than 35 percent, pinyon-juniper forest

Component Descriptions

Toldohn soils
Taxonomic Classification: Clayey, mixed, superactive, calcareous, mesic, shallow
Aridic Ustorthents
Landform: Ridges, hills
Parent material: Slope alluvium derived from sandstone and/or slope alluvium derived from sandstone and shale
Slope: 8 to 35 percent
Depth to restrictive feature: 5 to 20 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 2.3 inches (very low)
Shrink-swell potential: About 8.0 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Pinus edulis/Cercocarpus montanus-Amelanchier utahensis/Poa fendleriana
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XF633AZ
Present vegetation:
  Common trees: oneseed juniper, twoneedle pinyon
  Other plants: mountainmahogany, Utah serviceberry, Wyoming big sagebrush,
  blue grama, muttongrass, Indian ricegrass, antelope bitterbrush, bottlebrush
  squirreltail
Land capability subclass (nonirrigated): 6c

Typical Profile:
  A—0 to 2 inches; clay loam
  C1—2 to 7 inches; clay
  C2—7 to 15 inches; clay
  Cr—15 to 60 inches; bedrock

Vessilla soils
Taxonomic Classification: Loamy, mixed, superactive, calcareous, mesic Aridic Lithic
  Ustorthents
Landform: Ridges, hills
Parent material: Slope alluvium derived from sandstone
Slope: 8 to 20 percent
Depth to restrictive feature: 5 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 2.5 inches (very low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush
Ecological site: Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp.
  wyomingensis-epiphatra viridis/Poa fendleriana
Other ecological sites may occur in this map unit and vary in extent between
delineations.
Ecological site ID: F035XF627AZ

Present vegetation:
  Common trees: oneseed juniper, twoneedle pinyon
  Other plants: Indian ricegrass, Wyoming big sagebrush, green Mormon tea,
  muttongrass, Stansbury cliffrose, blue grama, bottlebrush squirreltail
Land capability subclass (nonirrigated): 6c

Typical Profile:
  A—0 to 4 inches; fine sandy loam
  C1—4 to 9 inches; fine sandy loam
  C2—9 to 18 inches; channery fine sandy loam
  2R—18 to 28 inches; bedrock

Rock outcrop
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

121—Torriorthents-Typic Haplocalcids association, 20 to 60 percent slopes

Map Unit Setting

Landform setting: escarpments, hills
Elevation: 4,800 to 5,500 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 53 to 56 degrees F
Frost-free period: 150 to 180 days

Map Unit Composition

Torriorthents and similar soils: 40 percent
Typic Haplocalcids and similar soils: 35 percent
Minor components: 25 percent

Component Descriptions

Torriorthents soils
Taxonomic Classification: Torriorthents
Landform: Hills
Slope: 20 to 60 percent
Drainage class: Well drained
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Mudstone/Sandstone Hills 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB201AZ
Land capability subclass (nonirrigated): 7e

Typical Profile:
C—0 to 60 inches; variable

Typic Haplocalcids soils
Taxonomic Classification: Typic Haplocalcids
Landform: Escarpments, hills
Slope: 20 to 60 percent
Drainage class: Well drained
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 35 percent
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Mudstone/Sandstone Hills 6-10” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB201AZ
Land capability subclass (nonirrigated): 7e

Typical Profile:
C—0 to 60 inches; variable

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

122—Trail-Riverwash association, 0 to 1 percent slopes

Map Unit Setting

Landform setting: flood plains
Elevation: 5,400 to 6,400 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Trail and similar soils: 50 percent
Riverwash: 40 percent
Minor components: 10 percent
• Jocity, occasionally flooded, Loamy Bottom 6-10” p.z.
• Ives, occasionally flooded, Sandy bottom 6-10” p.z.

Component Descriptions

Trail soils
Taxonomic Classification: Sandy, mixed, mesic Typic Torrifluvents
Landform: Flood plains
Parent material: Stream alluvium derived from sandstone and shale
Slope: 0 to 1 percent
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity: About 4.9 inches (low)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: Frequent
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Wash 6-10” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB216AZ

Present vegetation: Indian ricegrass, Cutler Mormon tea, alkali sacaton, broom snakeweed, needleandthread, sand dropseed, sandhill muhly, western wheatgrass, fourwing saltbush, giant dropseed, rubber rabbitbrush

Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 5 inches; loamy fine sand
C1—5 to 13 inches; stratified sand to loamy sand
C2—13 to 34 inches; stratified sand to loamy fine sand
C3—34 to 42 inches; stratified sand to loamy fine sand
C4—42 to 80 inches; stratified sand to loamy fine sand to fine sandy loam

Riverwash
Parent material: Alluvium from mixed sources
Flooding hazard: Frequent
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau

Other ecological sites may occur in this map unit and vary in extent between delineations.

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

123—Tunitcha family-Viewpoint-Owlspring association, 1 to 20 percent slopes

Map Unit Setting

Landform setting: mountains
Elevation: 8,500 to 9,000 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 40 to 43 degrees F
Frost-free period: 80 to 110 days

Map Unit Composition

Tunitcha family and similar soils: 35 percent
Viewpoint and similar soils: 35 percent
Owlspring and similar soils: 20 percent
Minor components: 10 percent
• Rock outcrop
• Cumulic Endoaquolls, ponderosa pine forest
• Sonsela, ponderosa pine forest

Component Descriptions

Tunitcha family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, frigid Typic Haplustalfs
Landform: Summit mountains
Parent material: Fan alluvium derived from tuff and/or fan alluvium derived from basalt
Slope: 5 to 20 percent
Surface fragments: About 1 percent gravel
Depth to restrictive feature: 40 to 60 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 6.9 inches (moderate)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: B
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Loamy Upland 17-25” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XH807AZ
Present vegetation: Arizona fescue, blue grama, bottlebrush squirreltail, Carex, Kentucky bluegrass, pingue rubberweed, rosy pussytoes, silvery lupine
Land capability subclass (nonirrigated): 5c

Typical Profile:
A—0 to 8 inches; clay loam
ABt—8 to 16 inches; clay loam
Bt1—16 to 28 inches; sandy clay loam
Bt2—28 to 36 inches; sandy clay loam
C—36 to 42 inches; very gravelly sandy clay loam
Cr—42 to 60 inches; bedrock

Viewpoint soils
Taxonomic Classification: Loamy, mixed, superactive, frigid Lithic Argiustolls
Landform: Mountains
Parent material: Colluvium and residuum weathered from basalt and/or colluvium and residuum weathered from tuff breccia
Slope: 2 to 20 percent
Surface fragments: About 15 percent gravel, about 2 percent stones
Depth to restrictive feature: 10 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 1.9 inches (very low)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Pinus ponderosa/Arctostaphylos uva-ursi/Festuca arizonica-Pteridium aquilinum

Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XH804AZ

Present vegetation: Kentucky bluegrass, Arizona fescue, Gambel oak, bottlebrush squirreltail, creeping barberry, mountain muhly, pingue rubberweed

Land capability subclass (nonirrigated): 5c

Typical Profile:
A—0 to 3 inches; gravelly loam
Bt1—3 to 7 inches; gravelly sandy clay loam
Bt2—7 to 17 inches; very cobbly sandy clay loam
R—17 to 27 inches; bedrock

Owlspring soils
Taxonomic Classification: Fine-silty, mixed, superactive, frigid Pachic Argiustolls
Landform: Mountains
Parent material: Slope alluvium over residuum weathered from basalt
Slope: 1 to 10 percent
Surface fragments: About 5 percent gravel
Depth to restrictive feature: 70 to 90 inches to bedrock, paralithic
Drainage class: Somewhat poorly drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 9.4 inches (high)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: B
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Meadow 17-25" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XH821AZ

Present vegetation: Baltic rush, redtop, tufted hairgrass, Rocky Mountain iris, rosy pussytoes, sedge, slender wheatgrass, western yarrow

Land capability subclass (nonirrigated): 5c

Typical Profile:
A—0 to 5 inches; loam
Bt1—5 to 10 inches; loam
Bt2—10 to 18 inches; loam
Bt3—18 to 25 inches; clay loam
Btb—25 to 31 inches; sandy clay loam
Btgb—31 to 43 inches; sandy clay loam
BCtb—43 to 66 inches; fine sandy loam
C1—66 to 72 inches; gravelly sandy loam
C2—72 to 81 inches; very fine sandy loam
Cr—81 to 90 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

124—Typic Torriorthents, 10 to 35 percent slopes

Map Unit Setting

Landform setting: hills
Elevation: 5,000 to 5,900 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Typic Torriorthents and similar soils: 100 percent
Minor components: 0 percent

Component Descriptions

Typic Torriorthents soils
Taxonomic Classification: Typic Torriorthents
Landform: Hills
Slope: 10 to 35 percent
Depth to restrictive feature: 4 to 40 inches to bedrock, paralithic
Drainage class: Well drained
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Mudstone/Sandstone Hills 6-10” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB201AZ
Present vegetation: galleta, Bigelow sagebrush, Indian ricegrass, shadscale saltbush, Torrey Mormon tea, alkali sacaton, bottlebrush squirreltail
Land capability subclass (nonirrigated): 8s

Typical Profile:
A—0 to 20 inches; variable
Cr—20 to 60 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

125—Umbarg-Millpaw families complex, 1 to 3 percent slopes

Map Unit Setting

Landform setting: fan terraces, stream terraces
Elevation: 7,600 to 8,000 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 110 to 130 days

Map Unit Composition

Umbarg family and similar soils: 50 percent
Millpaw family and similar soils: 30 percent
Minor components: 20 percent
• Manuelito, Mixed ponderosa pine forest
• Soils that are moderately coarse textured

Component Descriptions

Umbarg family soils
Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Cumulic Haplustolls
Landform: Stream terraces
Parent material: Fan alluvium derived from sandstone and shale and/or stream alluvium derived from sandstone and shale
Slope: 1 to 3 percent
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.5 inches (moderate)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: About 10 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Meadow 17-25” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XH821AZ
Present vegetation: western wheatgrass, Carex, Kentucky bluegrass, muttongrass, blue grama, bottlebrush squirreltail, western yarrow, pingue rubberweed, Indian ricegrass
Land capability subclass (nonirrigated): 6c
Typical Profile:
  A—0 to 2 inches; loam
  Bw1—2 to 9 inches; fine sandy loam
  Bw2—9 to 14 inches; fine sandy loam
  Bw3—14 to 40 inches; fine sandy loam
  BC—40 to 70 inches; sandy clay loam

Millpaw family soils
Taxonomic Classification: Fine, mixed, superactive, mesic Pachic Argiustolls
Landform: Fan terraces
Parent material: Fan alluvium derived from sandstone and shale
Slope: 1 to 3 percent
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 10.0 inches (high)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Meadow 17-25" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XH821AZ
Present vegetation: western wheatgrass, Kentucky bluegrass, blue grama, muttongrass, Carex, bottlebrush squirreltail, rubber rabbitbrush, western yarrow, pingue rubberweed, sagebrush
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 3 inches; silt loam
Bt1—3 to 6 inches; clay loam
Bt2—6 to 16 inches; clay loam
Btk—16 to 29 inches; clay loam
Bk1—29 to 47 inches; fine sandy loam
Bk2—47 to 70 inches; fine sandy loam
Bk3—70 to 76 inches; sandy clay loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

126—Uranium mined lands

Map Unit Setting

Landform setting: plateaus

Map Unit Composition

Uranium mined lands: 95 percent
Minor components: 5 percent

Component Descriptions

Uranium mined lands
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

127—Ustic Torriorthents, 10 to 35 percent slopes

Map Unit Setting

Landform setting: hills
Elevation: 5,800 to 6,700 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 51 to 52 degrees F
Frost-free period: 130 to 150 days

Map Unit Composition

Ustic Torriorthents and similar soils: 100 percent
Minor components: 0 percent

Component Descriptions

Ustic Torriorthents soils
Taxonomic Classification: Ustic Torriorthents
Landform: Structural bench hills
Slope: 10 to 35 percent
Depth to restrictive feature: 4 to 60 inches to bedrock, paralithic
Drainage class: Well drained
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Breaks 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA101AZ
Present vegetation: muttongrass, Bigelow sagebrush, Indian ricegrass, Stansbury cliffrose, galleta, Utah juniper, bottlebrush squirreltail, needleandthread, twoneedle pinyon
Land capability subclass (nonirrigated): 7e

Typical Profile:
A—0 to 31 inches; variable
Cr—31 to 41 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

128—Venadito clay, 1 to 6 percent slopes

Map Unit Setting

Landform setting: fan terraces, stream terraces
Elevation: 6,500 to 7,000 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition

Venadito and similar soils: 90 percent
Minor components: 10 percent
• Navajo, occasionally flooded, Saline Bottom 10-14” p.z.
• Kinusta family, Breaks 10-14” p.z.

Component Descriptions

Venadito soils
Taxonomic Classification: Very-fine, smectitic, mesic Chromic Haplotorrerts
Landform: Stream terraces, fan terraces
Parent material: Fan and stream alluvium derived from shale
Slope: 1 to 6 percent
Surface fragments: About 2 percent gravel
Depth to restrictive feature: 60 to 80 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: .001 to .06 in/hr (very slow)
Available water capacity: About 9.0 inches (moderate)
Shrink-swell potential: About 7.5 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: C
Calcium carbonate maximum: About 5 percent
Gypsum maximum: About 1 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 5 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-3AZ; Colorado Plateau Sagebrush-Grasslands
Ecological site: Clayey Bottom 10-14” p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XC305AZ
Present vegetation: western wheatgrass, blue grama, fourwing saltbush, bottlebrush squirreltail, galleta, rabbitbrush, Sphaeralcea, mat muhly
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; clay
Bss1—2 to 40 inches; clay
Bss2—40 to 55 inches; clay
Bss3—55 to 60 inches; clay
2R—60 to 70 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
129—Venzuni clay loam, 1 to 10 percent slopes

Map Unit Setting

*Landform setting:* fan terraces, stream terraces  
*Elevation:* 6,700 to 7,600 feet  
*Mean annual precipitation:* 14 to 18 inches  
*Mean annual air temperature:* 48 to 50 degrees F  
*Frost-free period:* 110 to 130 days

Map Unit Composition

Venzuni and similar soils: 90 percent  
Minor components: 10 percent  
• Parkelei family, Sandy Loam Upland 13-17” p.z.

Component Descriptions

Venzuni soils  
*Taxonomic Classification:* Very-fine, smectitic, mesic Aridic Haplusterts  
*Landform:* Stream terraces, fan terraces  
*Parent material:* Fan and stream alluvium derived from shale  
*Slope:* 1 to 10 percent  
*Drainage class:* Well drained  
*Slowest permeability:* .001 to .06 in/hr (very slow)  
*Available water capacity:* About 9.2 inches (high)  
*Shrink-swell potential:* About 7.0 percent (high)  
*Flooding hazard:* None  
*Ponding hazard:* None  
*Runoff class:* Very high  
*Hydrologic group:* C  
*Calcium carbonate maximum:* About 10 percent  
*Gypsum maximum:* None  
*Salinity maximum:* About 4 dS/m (very slightly saline)  
*Sodium adsorption ratio maximum:* About 5 (slightly sodic)  
*Major Land Resource Area:* 35; Colorado Plateau  
*Land Resource Unit:* 35-6AZ; Colorado Plateau Pinyon-Juniper-Sagebrush  
*Ecological site:* Juniperus osteosperma-Pinus edulis/Artemisia tridentata ssp. wyomingensis/Pascopyrum smithii  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
*Ecological site ID:* F035XF602AZ  
*Present vegetation:*  
• *Common trees:* oneseed juniper, twoneedle pinyon  
• *Other plants:* western wheatgrass, Indian ricegrass, Wyoming big sagebrush, blue grama, Greene rabbitbrush, galleta, pingue rubberweed, spike muhly  
*Land capability subclass (nonirrigated):* 6c

Typical Profile:  
A—0 to 1 inch; clay loam
Bss1—1 inch to 6 inches; clay loam
Bss2—6 to 25 inches; clay
Bss3—25 to 66 inches; clay
Bk—66 to 80 inches; clay

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

130—Verite-Manuelito complex, 1 to 8 percent slopes

Map Unit Setting

Landform setting: plateaus
Elevation: 7,500 to 8,000 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 110 to 130 days

Map Unit Composition

Verite and similar soils: 50 percent
Manuelito and similar soils: 45 percent
Minor components: 5 percent
• Akhoni family, ponderosa pine forest
• Umbarg family, ponderosa pine forest

Component Descriptions

Verite soils
Taxonomic Classification: Loamy, mixed, superactive, mesic Lithic Haplustalfs
Landform: Summits of plateaus
Parent material: Eolian deposits and slope alluvium derived from sandstone and shale and/or eolian deposits and residuum weathered from sandstone and shale
Slope: 1 to 8 percent
Surface fragments: About 1 percent gravel
Depth to restrictive feature: 10 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 2.1 inches (very low)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Pinus ponderosa/Bouteloua gracilis-Muhlenbergia montana
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XH826AZ
Present vegetation:

Common trees: Rocky Mountain juniper, twoneedle pinyon, ponderosa pine
Other plants: mountain muhly, muttongrass, blue grama, Gambel oak, bottlebrush squirreltail, prairie junegrass, fleabane, creeping barberry, rosy pussytoes

Land capability subclass (nonirrigated): 6c

Typical Profile:

A—0 to 2 inches; fine sandy loam
Bt—2 to 6 inches; clay loam
Bt2—6 to 11 inches; clay loam
R—11 to 21 inches; bedrock

Manuelito soils

Taxonomic Classification: Fine-loamy, mixed, superactive, mesic Typic Haplustalfs
Landform: Summits of plateaus
Parent material: Eolian deposits and stream alluvium derived from sandstone and shale
Slope: 1 to 8 percent
Depth to restrictive feature: 20 to 40 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 5.1 inches (low)
Shrink-swell potential: About 4.0 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: C
Calcium carbonate maximum: About 15 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Pinus ponderosa/Quercus gambelii-Artemisia tridentata/Bouteloua gracilis-Carex geophila
Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: F035XH811AZ

Present vegetation:

Common trees: ponderosa pine, Rocky Mountain juniper, twoneedle pinyon
Other plants: mountain muhly, blue grama, muttongrass, Gambel oak, bottlebrush squirreltail, broom snakeweed, prairie junegrass, pingue rubberweed, western yarrow

Land capability subclass (nonirrigated): 6c

Typical Profile:

A—0 to 6 inches; very fine sandy loam
AB—6 to 12 inches; very fine sandy loam
Bt—12 to 23 inches; sandy clay loam
Btk—23 to 30 inches; sandy clay loam
Bk—30 to 35 inches; fine sandy loam
2R—35 to 45 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
131—Verite-Rock outcrop-Flutedrock complex, 5 to 60 percent slopes

Map Unit Setting

Landform setting: plateaus
Elevation: 7,500 to 8,000 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 110 to 130 days

Map Unit Composition

Verite and similar soils: 40 percent
Rock outcrop: 30 percent
Flutedrock and similar soils: 25 percent
Minor components: 5 percent
- Manuelito, ponderosa pine forest
- Vessilla, pinyon-juniper forest

Component Descriptions

Verite soils
Taxonomic Classification: Loamy, mixed, superactive, mesic Lithic Haplustalfs
Landform: Plateaus
Parent material: Eolian deposits and residuum weathered from sandstone and shale
and/or eolian deposits and slope alluvium over residuum weathered from sandstone
Slope: 15 to 35 percent
Depth to restrictive feature: 10 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 2.0 inches (very low)
Shrink-swell potential: About 4.5 percent (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Hydrologic group: D
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Pinus ponderosa/Bouteloua gracilis-Muhlenbergia montana
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XH827AZ
Present vegetation:
- Common trees: Rocky Mountain juniper, twoneedle pinyon, ponderosa pine
- Other plants: mountain muhly, muttongrass, blue grama, Gambel oak, Kentucky bluegrass, bottlebrush squirreltail, prairie junegrass, creeping barberry, Rocky Mountain juniper, pine dropseed, pingue rubberweed
Land capability subclass (nonirrigated): 6c

Typical Profile:

Oi—0 to 2 inches; slightly decomposed plant material
A—2 to 5 inches; fine sandy loam
Bt1—5 to 9 inches; fine sandy loam
Bt2—9 to 14 inches; sandy clay loam
R—14 to 24 inches; bedrock

Rock outcrop
Flooding hazard: None
Ponding hazard: None
Major Land Resource Area: 35; Colorado Plateau

Other ecological sites may occur in this map unit and vary in extent between delineations.

Flutedrock soils

Taxonomic Classification: Loamy, mixed, superactive, nonacid, mesic Lithic Ustorthents

Landform: Plateaus
Parent material: Eolian material and slope alluvium over residuum derived from sandstone
Slope: 5 to 60 percent
Surface fragments: About 10 percent gravel
Depth to restrictive feature: 5 to 20 inches to bedrock, lithic
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 2.0 inches (very low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: D
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Pinus ponderosa/Bouteloua gracilis-Muhlenbergia montana
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XH827AZ

Present vegetation:

Common trees: Rocky Mountain juniper, twoneedle pinyon, ponderosa pine
Other plants: mountain muhly, muttongrass, blue grama, Gambel oak, Kentucky bluegrass, bottlebrush squirreltail, prairie junegrass, creeping barberry, Rocky Mountain juniper, pine dropseed, pingue rubberweed

Land capability subclass (nonirrigated): 6c

Typical Profile:

A—0 to 2 inches; fine sandy loam
C1—2 to 8 inches; fine sandy loam
C2—8 to 14 inches; loamy fine sand
R—14 to 24 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

132—Water

Map Unit Composition
Water: 100 percent
Minor components: 0 percent

Component Descriptions

Water

Major Land Resource Area: 35; Colorado Plateau
Other ecological sites may occur in this map unit and vary in extent between delineations.

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

133—Wepo clay loam, 0 to 3 percent slopes

Map Unit Setting

Landform setting: stream terraces
Elevation: 5,100 to 6,100 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 130 to 160 days

Map Unit Composition

Wepo and similar soils: 100 percent
Minor components: 0 percent

Component Descriptions

Wepo soils

Taxonomic Classification: Fine, mixed, superactive, mesic Vertic Haplocambids
Landform: Stream terraces
Parent material: Stream alluvium derived from shale
Slope: 0 to 3 percent
Drainage class: Well drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 9.5 inches (high)
Shrink-swell potential: About 7.5 percent (high)
Flooding hazard: Rare
Ponding hazard: None
Runoff class: Very low
Hydrologic group: C
Calcium carbonate maximum: About 15 percent
Gypsum maximum: None
Salinity maximum: About 8 dS/m (slightly saline)
Sodium adsorption ratio maximum: About 15 (moderately sodic)  
Major Land Resource Area: 35; Colorado Plateau  
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands  
Ecological site: Clayey Fan 6-10” p.z.  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
Ecological site ID: R035XB239AZ  
Present vegetation: alkali sacaton, galleta, fourwing saltbush, bottlebrush squirreltail, mound saltbush  
Land capability subclass (irrigated): 2s  
Land capability subclass (nonirrigated): 7s  
Typical Profile:  
A—0 to 3 inches; clay loam  
C1—3 to 32 inches; clay  
C2—32 to 84 inches; stratified sand to clay  
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.  

134—Wepo-Ives-Jolicy association, 0 to 2 percent slopes

**Map Unit Setting**

*Landform setting:* flood plains, stream terraces, valley floors  
*Elevation:* 5,800 to 6,200 feet  
*Mean annual precipitation:* 6 to 10 inches  
*Mean annual air temperature:* 51 to 54 degrees F  
*Frost-free period:* 130 to 160 days

**Map Unit Composition**

Wepo and similar soils: 35 percent  
Ives and similar soils: 30 percent  
Jolicy and similar soils: 25 percent  
Minor components: 10 percent  
• Riverwash, frequently flooded  
• Redlands, Loamy Upland 6-10” p.z.  
• Sheppard, Sandy Upland 6-10” p.z.

**Component Descriptions**

**Wepo soils**  
*Taxonomic Classification:* Fine, mixed, superactive, mesic Vertic Haplocambids  
*Landform:* Stream terraces on valley floors  
*Parent material:* Stream alluvium derived from shale  
*Slope:* 1 to 2 percent  
*Drainage class:* Well drained  
*Slowest permeability:* .06 to 0.2 in/hr (slow)  
*Available water capacity:* About 9.1 inches (high)  
*Shrink-swell potential:* About 7.5 percent (high)  
*Flooding hazard:* Rare  
*Ponding hazard:* None  
*Runoff class:* High  
*Hydrologic group:* D  
*Calcium carbonate maximum:* About 2 percent  
*Gypsum maximum:* About 2 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Clayey Wash 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB202AZ
Present vegetation: alkali sacaton, fourwing saltbush, western wheatgrass, blue grama, galleta, bottlebrush squirreltail
Land capability subclass (nonirrigated): 7c

Typical Profile:
- A—0 to 3 inches; clay
- Bw1—3 to 8 inches; clay
- Bw2—8 to 14 inches; clay
- Bw3—14 to 35 inches; silty clay
- Bk—35 to 45 inches; loam
- 2C1—45 to 51 inches; sandy loam
- 2C2—51 to 59 inches; sandy clay loam
- 2C3—59 to 68 inches; sandy loam
- 2C4—68 to 80 inches; loamy sand

Ives soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents
Landform: Flood plains
Parent material: Stream alluvium derived from sandstone
Slope: 0 to 2 percent
Drainage class: Somewhat excessively drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 8.4 inches (moderate)
Shrink-swell potential: About 1.0 percent (low)
Flooding hazard: Frequent
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 2 percent
Gypsum maximum: About 2 percent
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 2 (slightly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Sandy Wash 6-10" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XB216AZ
Present vegetation: Indian ricegrass, alkali sacaton, fourwing saltbush, western wheatgrass, galleta, sand dropseed, bottlebrush squirreltail, broom snakeweed
Land capability subclass (nonirrigated): 7c

Typical Profile:
- A—0 to 1 inch; very fine sandy loam
- C1—1 inch to 8 inches; very fine sandy loam
- C2—8 to 22 inches; fine sandy loam
Jocity soils

**Taxonomic Classification:** Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents

**Landform:** Flood plains

**Parent material:** Stream alluvium derived from sandstone and shale

**Slope:** 0 to 2 percent

**Drainage class:** Well drained

**Slowest permeability:** 0.2 to 0.6 in/hr (moderately slow)

**Available water capacity:** About 10.3 inches (high)

**Shrink-swell potential:** About 7.0 percent (high)

**Flooding hazard:** Frequent

**Ponding hazard:** None

**Runoff class:** High

**Hydrologic group:** D

**Calcium carbonate maximum:** About 2 percent

**Gypsum maximum:** About 2 percent

**Salinity maximum:** About 2 dS/m (nonsaline)

**Sodium adsorption ratio maximum:** About 4 (slightly sodic)

**Major Land Resource Area:** 35; Colorado Plateau

**Land Resource Unit:** 35-2AZ; Colorado Plateau Shrub-Grasslands

**Ecological site:** Loamy Wash 6-10" p.z.

Other ecological sites may occur in this map unit and vary in extent between delineations.

**Ecological site ID:** R035XB209AZ

**Present vegetation:** western wheatgrass, alkali sacaton, fourwing saltbush, Indian ricegrass, bottlebrush squirreltail, galleta

**Land capability subclass (nonirrigated):** 7c

**Typical Profile:**
- A—0 to 8 inches; loam
- C1—8 to 15 inches; clay loam
- C2—15 to 23 inches; fine sandy loam
- C3—23 to 45 inches; clay loam
- C4—45 to 65 inches; fine sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

### 135—Werito loam, 1 to 3 percent slopes

#### Map Unit Setting

**Landform setting:** plateaus

**Elevation:** 5,400 to 6,000 feet

**Mean annual precipitation:** 6 to 10 inches

**Mean annual air temperature:** 51 to 54 degrees F

**Frost-free period:** 130 to 160 days

#### Map Unit Composition

Werito and similar soils: 80 percent
Minors components: 20 percent
• Rock outcrop
• Badland
• Fajada, Loamy Upland 5-8” p.z. Sodic
• Huerfano, Loamy Upland 5-8” p.z. Sodic

Component Descriptions

Werito soils
Taxonomic Classification: Fine, mixed, superactive, mesic Sodic Haplocambids
Landform: Plateaus
Parent material: Alluvium over residuum weathered from shale
Slope: 1 to 3 percent
Surface fragments: About 10 percent gravel
Depth to restrictive feature: 20 to 40 inches to bedrock, paralithic
Drainage class: Well drained
Slowest permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 6.0 inches (low)
Shrink-swell potential: About 7.5 percent (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Calcium carbonate maximum: About 15 percent
Gypsum maximum: About 15 percent
Salinity maximum: About 4 dS/m (very slightly saline)
Sodium adsorption ratio maximum: About 30 (strongly sodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-2AZ; Colorado Plateau Shrub-Grasslands
Ecological site: Loamy Upland 6-10” p.z. Sodic

Other ecological sites may occur in this map unit and vary in extent between delineations.

Ecological site ID: R035XB228AZ
Present vegetation: alkali sacaton, galleta, mound saltbush, Indian ricegrass,
shadscale saltbush, sickle saltbush
Land capability subclass (nonirrigated): 7c

Typical Profile:
A—0 to 3 inches; loam
Bn1—3 to 7 inches; clay loam
Bn2—7 to 14 inches; clay loam
Bkn—14 to 17 inches; clay loam
2By—17 to 22 inches; silty clay
2C—22 to 34 inches; silty clay
2Cr—34 to 40 inches; bedrock

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

136—Yahmore-Sandark families complex, 1 to 15 percent slopes

Map Unit Setting

Landform setting: plateaus, structural benches
Elevation: 7,400 to 8,400 feet  
Mean annual precipitation: 18 to 22 inches  
Mean annual air temperature: 40 to 43 degrees F  
Frost-free period: 80 to 110 days

Map Unit Composition

Yahmore family and similar soils: 45 percent  
Sandark family and similar soils: 40 percent  
Minor components: 15 percent  
- Kunz  
- Sponseller family  
- Deza, ponderosa pine forest

Component Descriptions

Yahmore family soils  
Taxonomic Classification: Coarse-loamy, mixed, superactive, frigid Pachic Argiustolls  
Landform: Escarpments, structural benches on plateaus  
Parent material: Slope alluvium derived from sandstone and shale and/or slope alluvium derived from basalt  
Slope: 1 to 15 percent  
Surface fragments: About 3 percent gravel  
Drainage class: Well drained  
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)  
Available water capacity: About 5.8 inches (low)  
Shrink-swell potential: About 1.5 percent (low)  
Flooding hazard: None  
Ponding hazard: None  
Runoff class: Low  
Hydrologic group: B  
Calcium carbonate maximum: None  
Gypsum maximum: None  
Salinity maximum: About 2 dS/m (nonsaline)  
Sodium adsorption ratio maximum: About 0 (nonsodic)  
Major Land Resource Area: 35; Colorado Plateau  
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests  
Ecological site: Pinus ponderosa/Quercus gambelii/Carex geophila-Lupinus argenteus  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
Ecological site ID: F035XH812AZ  
Present vegetation: Gambel oak, blue grama, bottlebrush squirreltail,  
needleandthread, Arizona fescue, mountain big sagebrush, mountain muhly,  
Rocky Mountain juniper, pingue rubberweed, silvery lupine  
Land capability subclass (nonirrigated): 5c

Typical Profile:  
A—0 to 1 inch; loamy fine sand  
Bt—1 inch to 12 inches; fine sandy loam  
BC—12 to 60 inches; loamy fine sand

Sandark family soils  
Taxonomic Classification: Sandy, mixed, frigid Entic Haplustolls  
Landform: Escarpments structural benches on plateaus  
Parent material: Slope alluvium derived from sandstone  
Slope: 1 to 15 percent
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity: About 4.6 inches (low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Hydrologic group: B
Calcium carbonate maximum: None
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Pinus ponderosa/Quercus gambelii/Carex geophila-Lupinus argentaeus
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XH812AZ
Present vegetation: Gambel oak, bottlebrush squirreltail, nodding brome, Arizona fescue, mountain brome, mountain muhly, needleandthread, silvery lupine
Land capability subclass (nonirrigated): 5c

Typical Profile:
A—0 to 5 inches; loamy fine sand
C1—5 to 19 inches; loamy fine sand
C2—19 to 35 inches; loamy sand
C3—35 to 60 inches; loamy sand

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

137—Zia sandy loam, 1 to 5 percent slopes

Map Unit Setting
Landform setting: stream terraces, valley floors
Elevation: 5,900 to 6,600 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Map Unit Composition
Zia and similar soils: 85 percent
Minor components: 15 percent
• Riverwash
• Radnik, occasionally flooded, Loamy Bottom 10-14” p.z.
• Pinavetes family, Sandy Upland 10-14” p.z.

Component Descriptions
Zia soils
Taxonomic Classification: Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torriorthents
Landform: Stream terraces on valley floors
Parent material: Eolian deposits and stream alluvium derived from sandstone and shale
Slope: 1 to 5 percent
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 5.3 inches (low)
Shrink-swell potential: About 2.0 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B
Calcium carbonate maximum: About 2 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-1AZ; Colorado Plateau Mixed Grass Plains
Ecological site: Sandy Loam Upland 10-14" p.z.
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: R035XA117AZ
Present vegetation: blue grama, Indian ricegrass, black grama, fourwing saltbush, bottlebrush squirreltail, galleta, needleandthread, sand dropseed, Greene rabbitbrush, broom snakeweed
Land capability subclass (nonirrigated): 6c

Typical Profile:
A—0 to 2 inches; sandy loam
C1—2 to 8 inches; fine sandy loam
C2—8 to 22 inches; loamy sand
C3—22 to 34 inches; sandy loam
C4—34 to 50 inches; loamy sand
Ck—50 to 80 inches; sandy loam
C5—60 to 80 inches; sandy loam

See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.

138—Zilditloi-Quamon family complex, 40 to 80 percent slopes

Map Unit Setting
Landform setting: escarpments, plateaus
Elevation: 7,800 to 9,000 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 40 to 43 degrees F
Frost-free period: 80 to 110 days

Map Unit Composition
Zilditloi and similar soils: 45 percent
Quamon family and similar soils: 30 percent
Minor components: 25 percent
• Rock outcrop
• Klizhin family, ponderosa pine forest

Component Descriptions

Zilditloi soils
Taxonomic Classification: Mixed, frigid Typic Ustipsamments
Landform: High elevation escarpments on plateaus
Parent material: Slope alluvium, colluvium, and residuum weathered from sandstone
Slope: 40 to 80 percent
Drainage class: Excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 3.2 inches (low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Hydrologic group: B
Calcium carbonate maximum: About 1 percent
Gypsum maximum: None
Salinity maximum: About 2 dS/m (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)
Major Land Resource Area: 35; Colorado Plateau
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests
Ecological site: Pinus ponderosa-Populus tremuloides/Symphoricarpos oreophilus/
Carex geophila-Geranium
Other ecological sites may occur in this map unit and vary in extent between delineations.
Ecological site ID: F035XH818AZ
Present vegetation: Kentucky bluegrass, Arizona fescue, bottlebrush squirreltail,
Gambel oak, mountain muhly, muttongrass, prairie junegrass, western yarrow,
Rocky Mountain juniper
Land capability subclass (nonirrigated): 5c

Typical Profile:
A—0 to 4 inches; loamy fine sand
AC—4 to 8 inches; loamy fine sand
C1—8 to 16 inches; loamy fine sand
C2—16 to 36 inches; sand
C3—36 to 60 inches; sand

Quamon family soils
Taxonomic Classification: Sandy-skeletal, mixed, frigid Typic Ustorthents
Landform: High elevation escarpments on plateaus
Parent material: Slope alluvium derived from sandstone
Slope: 40 to 80 percent
Surface fragments: About 40 percent gravel
Drainage class: Excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 1.6 inches (very low)
Shrink-swell potential: About 1.5 percent (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium  
Hydrologic group: A  
Calcium carbonate maximum: None  
Gypsum maximum: None  
Salinity maximum: About 2 dS/m (nonsaline)  
Sodium adsorption ratio maximum: About 0 (nonsodic)  
Major Land Resource Area: 35; Colorado Plateau  
Land Resource Unit: 35-8AZ; Colorado Plateau Ponderosa Pine Forests  
Ecological site: Pinus ponderosa-Populus tremuloides/Symphoricarpos oreophilus/Carex geophila-Geranium  
Other ecological sites may occur in this map unit and vary in extent between delineations.  
Ecological site ID: F035XH818AZ  
Present vegetation: Arizona fescue, Kentucky bluegrass, bottlebrush squirreltail, mountain muhly, Gambel oak, blue grama, prairie junegrass, western yarrow, Rocky Mountain juniper, common juniper  
Land capability subclass (nonirrigated): 5c  
Typical Profile:  
A—0 to 7 inches; very channery sandy loam  
C1—7 to 29 inches; very channery loamy sand  
C2—29 to 60 inches; very channery loamy sand  
See “Soil Series and Their Morphology” for a detailed description of the soil component and its Range in Characteristics.
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 defined in the following paragraphs.

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

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 Fluvents (Fluv, meaning river, plus ent, from Entisols).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Torrifluvents (Torr, meaning hot and dry, plus Fluvents, the suborder of the Entisols on flood plains).

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

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents.

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

Soils and Their Morphology

In this section, each soil recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each
soil. A pedon, a small three-dimensional area of soil, that is typical of the soil in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (Soil Survey Division Staff, 1993) and in the “Field Book for Describing and Sampling Soils” (Schoeneberger and others, 2002). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (Soil Survey Staff, 1999) and in “Keys to Soil Taxonomy” (Soil Survey Staff, 2006). Unless otherwise indicated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

**Akhoni family**

*Depth class:* shallow  
*Drainage class:* well  
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)  
*Geomorphic position:* summits of plateaus  
*Parent material:* Slope alluvium and residuum derived from sandstone  
*Elevation:* 8,500 to 9,200 feet  
*Slope:* 1 to 15 percent  
*Climatic data:*  
  - Mean annual precipitation: 18 to 22 inches  
  - Mean annual air temperature: 40 to 43 degrees F  
  - Frost-free period: 80 to 110 days  
*Taxonomic class:* Loamy, mixed, superactive, frigid Lithic Haplustolls

**Typical Pedon**

Akhoni family in an area of mapping unit Akhoni-Venable families complex, 0 to 15 percent slopes; McKinley County, New Mexico; Chuska Peak Quadrangle; lat. 35 degrees 58 minutes 13 seconds N. and long. 108 degrees 49 minutes 56 seconds W., NAD 27.

A—0 to 1 inch; pale brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; single grain; loose, very friable, nonsticky and nonplastic; many very fine and common fine roots; noneffervescent; slightly alkaline (pH 7.4); abrupt smooth boundary.  
Bw—1 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, black (10YR 2/1) moist; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots; noneffervescent; neutral (pH 7.0); abrupt wavy boundary.  
C—5 to 11 inches; brown (10YR 4/2) very gravelly fine sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; few very fine roots; 2 percent sandstone cobbles, 40 percent gravel; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.  
R—11 inches; hard sandstone bedrock.

**Range in Characteristics**

*Particle-size control section:* 5 to 18 percent clay  
*Depth to bedrock:* 10 to 20 inches  
*Reaction:* neutral or slightly acid  
*Calcium carbonate equivalent:* 0 to 1 percent  
*Gypsum:* none  
*Salinity:* EC of 0 to 2 dS/m  
*Sodicity:* none
A horizon:
  Hue: 7.5YR, 10YR
  Value: 3 or 4 dry, 2 to 3 moist
  Chroma: 2 to 3, dry or moist

B and C horizons:
  Hue: 7.5YR, 10YR
  Value: 4 or 5 dry, 2 to 5 moist
  Chroma: 2 to 4 dry, 1 to 3 moist
  Texture: fine sandy loam, sandy loam, loam, sandy clay loam
  Rock fragments: average of 0 to 25 percent; 0 to 5 percent channers, 0 to 5 percent flagstones

Aquima Series

Depth class: very deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: stream terraces on valley floors
Parent material: Stream alluvium derived from sandstone and shale
Elevation: 6,000 to 6,400 feet
Slope: 1 to 5 percent
Climatic data:
  Mean annual precipitation: 10 to 14 inches
  Mean annual air temperature: 50 to 53 degrees F
  Frost-free period: 120 to 150 days
Taxonomic class: Fine-loamy, mixed, superactive, mesic Ustic Haplocambids

Typical Pedon

Aquima silt loam in an area of mapping unit Aquima-Hawaikuh silt loams, 1 to 5 percent slopes; Apache County, Arizona; Chafin Well Quadrangle; lat. 35 degrees 14 minutes 59 seconds N. and long. 109 degrees 04 minutes 01 seconds W., NAD 27.

A—0 to 3 inches; reddish brown (2.5YR 4/4) silt loam, dark reddish brown (2.5YR 3/4) moist; massive; loose, very friable, nonsticky and nonplastic; few very fine roots; strongly effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

AB—3 to 8 inches; light reddish brown (5YR 6/3) silt loam, reddish brown (5YR 5/3) moist; thin platy structure; soft, very friable, slightly sticky and slightly plastic; few very fine and fine roots; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bw1—8 to 20 inches; reddish brown (2.5YR 4/4) silt loam, dark reddish brown (2.5YR 3/4) moist; weak very fine and fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few very fine roots; few very fine irregular pores; strongly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Bw2—20 to 48 inches; reddish brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) moist; weak very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine irregular pores; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C1—48 to 52 inches; yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; massive; slightly hard, friable, nonsticky, nonplastic; few very fine roots, strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C2—52 to 70 inches; red (2.5 YR 4/6) silt loam, dark red (2.5 YR 3/6) moist; massive; slightly hard, friable; strongly effervescent; moderately alkaline (pH 8.0).
Range in Characteristics

Particle-size control section: 20 to 35 percent clay
Calcium carbonate equivalent: 0 to 10 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A and AB horizons:
  Value: 4 to 6 dry, 3 to 5 moist
  Chroma: 4 or 6 dry, 2.5 moist
  Reaction: neutral to moderately alkaline

Bw horizon:
  Hue: 2.5YR, 5YR
  Value: 4 or 5 dry, 3 or 4 moist
  Chroma: 4 or 6, dry or moist
  Texture: silt loam, clay loam
  Reaction: slightly or moderately alkaline

Bk and C horizons: (when present)
  Hue: 10R, 2.5YR, 5YR
  Value: 4 or 5 dry, 3 or 4 moist
  Chroma: 4 or 6 dry, 4 to 8 moist
  Texture: clay loam, sandy clay loam, silty clay loam, loam
  Rock fragments: 0 to 35 percent gravel
  Reaction: slightly to strongly alkaline

Arabrab Series

Depth class: shallow
Drainage class: well
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Geomorphic position: summits of mesas and plateaus
Parent material: Eolian material and slope alluvium derived from sandstone and shale
Elevation: 6,300 to 7,800 feet
Slope: 2 to 8 percent
Climatic data:
  Mean annual precipitation: 14 to 18 inches
  Mean annual air temperature: 48 to 51 degrees F
  Frost-free period: 110 to 140 days
Taxonomic class: Loamy, mixed, superactive, mesic Lithic Haplustalfs

Typical Pedon

Arabrab fine sandy loam in an area of mapping unit Evpark-Vessilla-Arabrab complex, 1 to 25 percent slopes; Navajo County, Arizona; Big Willow Spring Canyon Quadrangle; about 4.5 miles north of Beshbito Rest Area; lat. 35 degrees 35 minutes 27 seconds N. and long. 109 degrees 30 minutes 51 seconds W., NAD 27.

A—0 to 3 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak fine granular structure; soft, loose, nonsticky and nonplastic; common very fine roots; 4 percent round shale and sandstone gravel; noneffervescent; slightly alkaline (pH 7.6); abrupt smooth boundary.

Bt—3 to 11 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; moderately hard, very friable, moderately sticky and moderately plastic; many very fine roots; few very fine
discontinuous tubular pores; many continuous distinct clay films on faces of peds and lining pores; 1 percent gravel; noneffervescent; slightly alkaline (pH 7.6); clear smooth boundary.

Btk—11 to 16 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; moderate fine angular blocky structure; moderately hard, very friable, moderately sticky and moderately plastic; common very fine and few fine and medium roots; few very fine discontinuous tubular pores; many continuous distinct clay films on faces of peds and lining pores; 3 percent sandstone and angular shale gravel; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

R—16 inches; hard sandstone bedrock

**Range in Characteristics**

- Particle-size control section: 18 to 30 percent clay
- Depth to lithic contact: 6 to 20 inches to sandstone
- Rock fragments: 0 to 15 percent gravel
- Calcium carbonate equivalent: 0 to 5 percent
- Gypsum: none
- Salinity: EC of 0 to 2 dS/m
- Sodicity: none

**A horizon:**
- Hue: 5YR, 7.5YR, 10YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 2 to 4 moist
- Reaction: neutral or slightly alkaline

**Bt and Btk horizons:**
- Hue: 5YR, 7.5YR
- Value: 3 to 5 moist
- Chroma: 4 or 6 dry, 3 to 6 moist
- Texture: clay loam, sandy clay loam, fine sandy loam, loam
- Reaction: neutral to moderately alkaline

**Arches Series**

*Depth class:* very shallow and shallow
*Drainage class:* somewhat excessively
*Slowest permeability:* 6.0 to 20 in/hr (rapid)
*Geomorphic position:* dunes
*Parent material:* Eolian material and residuum derived from sandstone
*Elevation:* 6,000 to 6,600 feet
*Slope:* 15 to 60 percent
*Climatic data:*
  - Mean annual precipitation: 10 to 14 inches
  - Mean annual air temperature: 50 to 53 degrees F
  - Frost-free period: 120 to 150 days
*Taxonomic class:* Mixed, mesic Lithic Torripsamments

**Typical Pedon**

Arches loamy fine sand in an area of mapping unit Pinavetes family-Arches complex, 8 to 60 percent slopes; Apache County, Arizona; Wide Ruins Quadrangle; lat. 35 degrees 24 minutes 17 seconds N. and long. 109 degrees 30 minutes 00 seconds W., NAD 27.

A—0 to 1 inch; light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/3) moist; weak fine granular structure; loose, nonsticky and nonplastic; few very fine
roots; 2 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C1—1 to 5 inches; light reddish brown (5YR 6/4) loamy sand, reddish brown (5YR 4/4) moist; massive; loose, nonsticky and nonplastic; common very fine roots; 4 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C2—5 to 11 inches; reddish yellow (5YR 6/6) loamy sand, reddish brown (5YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; 2 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

R—11 inches; sandstone bedrock.

Range in Characteristics

Particle-size control section: 2 to 10 percent clay
Depth to lithic contact: 10 to 20 inches to sandstone
Rock fragments: 2 to 4 percent gravel
Reaction: moderately alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: none
Salinity: EC of 0 dS/m
Sodicity: none

A and C horizons:
  Hue: 2.5YR, 5YR
  Chroma: 4 or 6 dry, 3 or 4 moist
  Texture: sand, loamy sand, loamy fine sand

Atlatl Series

Depth class: moderately deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: escarpments on plateaus
Parent material: Slope alluvium derived from sandstone and limestone
Elevation: 7,200 to 7,800 feet
Slope: 15 to 25 percent
Climatic data:
  Mean annual precipitation: 14 to 18 inches
  Mean annual air temperature: 48 to 51 degrees F
  Frost-free period: 110 to 140 days
Taxonomic class: Coarse-loamy, carbonatic, mesic Aridic Calciustepts

Typical Pedon

Atlatl very gravelly sandy loam in an area of mapping unit Atlatl-Nizhoni family-Rock outcrop complex, 15 to 30 percent slopes; McKinley County, New Mexico; Todilto Park Quadrangle; lat. 35 degrees 56 minutes 20 seconds N. and long. 108 degrees 56 minutes 10 seconds W., NAD 27.

A—0 to 2 inches; light yellowish brown (10YR 6/4) very gravelly sandy loam, brown (10YR 4/3) moist; massive; loose, very friable, slightly sticky and slightly plastic; many very fine and fine roots; 40 percent gravel; violently effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Bk1—2 to 8 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak very fine to medium subangular blocky structure; soft, very friable, slightly sticky
and slightly plastic; many very fine and fine roots; very few masses and filaments of calcium carbonate; 10 percent gravel; violently effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

   Bk2—8 to 19 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak very fine to medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; very few masses and filaments of calcium carbonate; 10 percent gravel; violently effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

   Bk3—19 to 31 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; massive; loose, very friable, slightly sticky and slightly plastic; common very fine and fine roots; very few masses and filaments of calcium carbonate; 15 percent gravel; violently effervescent; moderately alkaline (pH 8.2).

   R—31 inches; limestone and sandstone bedrock.

Range in Characteristics

Particle-size control section: 5 to 18 percent clay
Depth to lithic contact: 20 to 40 inches
Rock fragments: 0 to 15 percent in the control section.
Reaction: slightly or moderately alkaline
Calcium carbonate: 40 to 70 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
   Hue: 5YR, 7.5YR, 10YR
   Value: 4 or 5 dry, 3 to 6 moist
   Chroma: 4 or 6 dry, 3 to 6 moist
   Rock fragments: average of 20 to 40 percent; 20 to 35 percent fine gravel and 0 to 20 percent channers (less than 3 in.)
   Calcium carbonate equivalent: 10 to 15 percent

Bk horizons:
   Hue: 2.5YR, 5YR, 7.5YR, 10YR.
   Value: 5 to 7 dry, 4 to 6 moist
   Chroma: 3 to 6, dry or moist
   Texture: sandy loam, loam
   Rock fragments: average of 0 to 20 percent; 0 to 20 percent gravel and 0 to 20 percent flagstones
   Calcium carbonate equivalent: 40 to 70 percent

Bacobi Series

Depth class: moderately deep
Drainage class: well
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Geomorphic position: mesas
Parent material: fan alluvium derived from sandstone and shale
Elevation: 4,800 to 5,500 feet
Slope: 1 to 5 percent
Climatic data:
   Mean annual precipitation: 6 to 10 inches
   Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

**Taxonomic class:** Fine-loamy, mixed, superactive, mesic Typic Haplargids

**Typical Pedon**

Bacobi fine sandy loam in an area of mapping unit Bacobi fine sandy loam, 1 to 5 percent slopes; Navajo County, Arizona; about 7 miles southwest of Oraibi in the Soil Survey of Hopi Area, Arizona; about 2,700 feet west and 2,000 feet south of the northeast corner of sec. 29, T. 28 N, R. 14 E.

A—0 to 2 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; weak thin platy structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine vesicular pores; strongly effervescent; moderately alkaline (pH 7.9); abrupt smooth boundary.

Bw—2 to 6 inches; brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and slightly plastic; many very fine roots; many very fine interstitial pores; strongly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Bt—6 to 15 inches; brown (7.5YR 5/4) fine sandy loam, strong brown (7.5YR 4/6) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many very fine roots; many very fine tubular pores; common clay bridging of sand grains, few thin patchy clay films on faces of peds; strongly effervescent; moderately alkaline (pH 7.9); clear smooth boundary.

Btk1—15 to 26 inches; mixed brown (7.5YR 5/4) and dark yellowish brown (10YR 4/4) sandy clay loam, brown (7.5YR 4/4) and dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, firm slightly sticky and plastic; common very fine roots; common very fine tubular pores; common clay bridging of sand grains, few thin patchy clay films on faces of peds; strongly effervescent, common fine rounded lime masses; moderately alkaline (pH 8.0); clear smooth boundary.

Btk2—26 to 33 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; common clay bridging of sand grains, few thin patchy clay films on faces of peds; strongly effervescent, common fine rounded lime masses; moderately alkaline (pH 8.1); clear smooth boundary.

Bk—33 to 36 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; strongly effervescent, many very fine rounded lime masses; moderately alkaline (pH 8.2); abrupt smooth boundary.

Btk2—36 to 60 inches; interbedded sandstone and shale (gypsiferous mudstone).

**Range in Characteristics**

Particle-size control section: 18 to 27 percent clay

Reaction: slightly or moderately alkaline

Rock fragments: 0 to 10 percent

Calcium carbonate equivalent: 0 to 15 percent

Gypsum: none

Salinity: EC of 0 to 2 dS/m

SAR: 1 to 10

A horizon:

Hue: 7.5YR, 5YR

Value: 4 to 6 dry, 4 or 5 moist

Chroma: 4 or 6, dry or moist
Bw horizon:
Hue: 7.5YR, 5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: fine sandy loam, very fine sandy loam, sandy clay loam

Bt horizon:
Hue: 7.5YR, 10YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 4 or 6, dry or moist
Texture: fine sandy loam, sandy clay loam

Bk horizon (when present):
Hue: 7.5YR, 10YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 4 or 6, dry or moist
Texture: fine sandy loam, sandy loam, sandy clay loam

Barx family

Depth class: very deep
Drainage class: well
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Geomorphic position: stable landslides and summits of plateaus
Parent material: slope alluvium derived from sandstone
Elevation: 6,000 to 7,000 feet
Slope: 10 to 35 percent
Climatic data:
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days
Taxonomic class: Fine-loamy, mixed, superactive, mesic Ustic Calciargids

Typical Pedon

Barx family in an area of mapping unit Barx-Strych-Doakum families complex, 5 to 65 percent slopes; San Juan County, New Mexico; Naschitti Quadrangle; lat. 36 degrees 02 minutes 49 seconds N. and long. 108 degrees 42 minutes 49 seconds W., NAD 27.
A—0 to 2 inches; light brown (7.5YR 6/3) fine sandy loam, brown (7.5YR 5/3) moist; single grain; loose, very friable, nonsticky and nonplastic; few very fine and fine roots; 1 percent gravel; violently effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.
Bw—2 to 6 inches; light brown (7.5YR 6/3) fine sandy loam, brown (7.5YR 5/3) moist; weak very fine and fine subangular blocky structure parting to weak very fine and fine granular; soft, very friable, slightly sticky and nonplastic; 1 percent gravel and 1 percent cobbles; violently effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.
Bt—6 to 12 inches; light brown (7.5YR 6/3) clay loam, brown (7.5YR 5/4) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, moderately sticky and moderately plastic; few faint clay films on faces of peds; violently effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.
Btk—12 to 16 inches; pink (7.5YR 7/3) sandy clay loam, light brown (7.5YR 6/3) moist; weak very fine and fine subangular blocky structure; hard, friable, moderately sticky and moderately plastic; few faint clay films on faces of peds; common fine
masses of calcium carbonate; violently effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bk1—16 to 32 inches; pink (7.5YR 7/3) sandy clay loam, light brown (7.5YR 6/3) moist; weak very fine and fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine masses of calcium carbonate; violently effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.

Bk2—32 to 52 inches; pink (7.5YR 7/3) sandy clay loam, light brown (7.5YR 6/3) moist; massive; very hard, firm, moderately sticky and slightly plastic; many fine masses of calcium carbonate; violently effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.

Bk3—52 to 60 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; massive; very hard, firm, slightly sticky and slightly plastic; common fine masses of calcium carbonate; violently effervescent; strongly alkaline (pH 9.0).

**Range in Characteristics**

Particle-size control section: 18 to 35 percent clay  
Reaction: slightly to strongly alkaline  
Calcium carbonate equivalent: 15 to 25 percent  
Gypsum: none  
Salinity: EC of 0 to 2 dS/m  
Sodicity: none  

A and Bw horizons:  
  Hue: 10YR, 7.5YR  
  Value: 4 or 5 moist  
  Chroma: 2 to 4, dry or moist  

Bt and Btk horizons:  
  Value: 5 or 6 dry, 4 or 5 moist  
  Chroma: 3 or 4, dry or moist  
  Texture: sandy clay loam, clay loam  

Bk horizon:  
  Hue: 2.5YR, 5YR  
  Value: 5 to 8 dry  
  Chroma: 2 to 6, dry or moist  
  Texture: sandy clay loam, fine sandy loam  

**Bebeevar Series**

*Depth class:* very deep  
*Drainage class:* moderately well  
*Slowest permeability:* 6.0 to 20.0 in/hr (rapid)  
*Geomorphic position:* flood plains  
*Parent material:* stream alluvium derived from sandstone  
*Elevation:* 5,500 to 6,200 feet  
*Slope:* 0 to 1 percent  
*Climatic data:*  
  Mean annual precipitation: 10 to 14 inches  
  Mean annual air temperature: 50 to 53 degrees F  
  Frost-free period: 120 to 160 days  
*Taxonomic class:* Sandy, mixed, mesic Oxyaquic Torrifluvents
Typical Pedon

Bebeevar loamy very fine sand in an area of mapping unit Riverwash-Bebeevar association, 0 to 1 percent slopes; San Juan County, New Mexico; Great Bend Quadrangle; lat. 36 degrees 10 minutes 36 seconds N, and long. 108 degrees 31 minutes 48 seconds W., NAD 27.

AC—0 to 1 inch; light brownish gray (2.5Y 6/2) loamy very fine sand with fine strata of very fine sand and silt, grayish brown (2.5Y 5/2) moist; weak thin platy structure; loose, nonsticky and nonplastic; few very fine and fine roots; very slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C1—1 to 4 inches; light yellowish brown (2.5Y 6/3) fine sand, light olive brown (2.5Y 5/3) moist; single grain; loose, nonsticky and nonplastic; noneffervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

C2—4 to 16 inches; light olive brown (2.5Y 5/3) fine sand with fine strata of very fine sand and silt, olive brown (2.5Y 4/3) moist; single grain; loose, nonsticky and nonplastic; few very fine, fine, and medium roots; noneffervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

C3—16 to 48 inches; light yellowish brown (2.5Y 6/3) fine sand, light olive brown (2.5Y 5/3) moist; single grain; loose, nonsticky and nonplastic; noneffervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

C4—48 to 55 inches; light yellowish brown (2.5Y 6/3) medium sand, light olive brown (2.5Y 5/3) moist; single grain; loose, nonsticky and nonplastic; 1 percent gravel; noneffervescent; water-saturated conditions at 52 inches; slightly alkaline (pH 7.8); abrupt smooth boundary.

C5—55 to 60 inches; light yellowish brown (2.5Y 6/3) medium and coarse sand, light olive brown (2.5Y 5/3) moist; single grain; loose, nonsticky and nonplastic; 1 percent gravel; water table at 58 inches; noneffervescent; slightly alkaline (pH 7.8).

Range in Characteristics

Particle-size control section: 2 to 10 percent clay
Rock fragments: 0 to 5 percent gravel
Reaction: slightly or moderately alkaline
Depth to seasonal water table: 4 to 5 feet
Redoximorphic features: none to many, fine to medium, and faint to distinct, dark yellowish brown, redox concentrations. Redox depletions are present below 40 inches and generally in finer-textured horizons or strata.
Calcium carbonate equivalent: 0 to 2 percent (some pedons are calcareous to the surface)
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2

AC horizon:
Hue: 10YR, 2.5Y
Value: 5 to 7 dry, 4 to 6 moist
Chroma: 2 to 4, dry or moist
Texture: loamy fine sand, very fine sandy loam, fine sand.

C horizons:
Hue: 10YR, 2.5Y.
Value: 4 to 7 dry, 4 to 6 moist
Chroma: 2 to 6, dry or moist
Texture: stratified fine sand to very fine sandy loam; most horizons are
dominantly fine sand, loamy fine sand, and sand, with laminations and thin strata of very fine sand, loamy very fine sand, or clay

**Begay Series**

*Depth class:* very deep
*Drainage class:* well
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)
*Geomorphic position:* fan terraces
*Parent material:* Eolian material and fan alluvium derived from sandstone
*Elevation:* 5,800 to 7,200 feet
*Slope:* 1 to 25 percent
*Climatic data:*
  - Mean annual precipitation: 10 to 14 inches
  - Mean annual air temperature: 50 to 53 degrees F
  - Frost-free period: 120 to 150 days
*Taxonomic class:* Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids

**Typical Pedon**

Begay fine sandy loam in an area of mapping unit Begay-Penistaja family complex, 2 to 8 percent slopes; Navajo County, Arizona; Rotten Bananas Butte Quadrangle; about 1 mile southwest of Rotten Bananas Butte; lat. 35 degrees 13 minutes 03 seconds N. and long. 110 degrees 20 minutes 23 seconds W., NAD 27.

A—0 to 2 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; single grain; loose, nonsticky and nonplastic; 1 percent gravel; common very fine roots; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bw—2 to 8 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; few very fine discontinuous tubular pores; 2 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk1—8 to 23 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; many very fine roots; many very fine discontinuous tubular pores; common fine calcium carbonate masses; 2 percent gravel; violently effervescent, moderately alkaline (pH 8.2); clear smooth boundary.

Bk2—23 to 46 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; few very fine discontinuous tubular pores; calcium carbonate coats on bottom of coarse fragments; 3 percent gravel; violently effervescent, moderately alkaline (pH 8.2); clear smooth boundary.

C—46 to 63 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 4/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; 2 percent gravel; violently effervescent, strongly alkaline (pH 8.8); abrupt smooth boundary.

Ck—63 to 80 inches; pink (7.5YR 7/4) sandy loam, brown (7.5YR 5/3) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; few fine calcium carbonate masses; 3 percent gravel; violently effervescent, strongly alkaline (pH 8.6).

**Range in Characteristics**

Particle-size control section: 2 to 18 percent clay
Rock fragments: 0 to 7 percent gravel
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 0 to 5 percent
Gypsum content: 0 to 1 percent
Salinity: EC of 0 to 8 dS/m
Sodicity: SAR of 0 to 2

A horizon:
  Hue: 5YR, 7.5YR, 10YR
  Value: 5 to 7 dry, 3 or 4 moist
  Chroma: 3 to 6, dry or moist

Bw horizons:
  Hue: 5YR, 7.5YR, 10YR
  Value: 4 to 7 dry, 3 to 5 moist
  Chroma: 3 to 6, dry or moist
  Texture: fine sandy loam, sandy loam

Bk and C horizons:
  Hue: 5YR, 7.5 YR, 10YR
  Value: 4 to 8 dry, 4 to 8 moist
  Chroma: 4 or 6, dry or moist
  Texture: sandy loam, fine sandy loam, clay, loamy sand

**Benally family**

*Depth class:* deep
*Drainage class:* well
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)
*Geomorphic position:* fan terraces and stream terraces
*Parent material:* Slope alluvium and stream alluvium over residuum derived from sandstone and shale
*Elevation:* 5,800 to 6,500 feet
*Slope:* 0 to 5 percent
*Climatic data:*
  - Mean annual precipitation: 6 to 10 inches
  - Mean annual air temperature: 51 to 54 degrees F
  - Frost-free period: 130 to 160 days
*Taxonomic class:* Fine-loamy, mixed, superactive, mesic Typic Natrigypsids

**Typical Pedon**

Benally family in an area of mapping unit Benally family-Fruitland association, 1 to 5 percent slopes; San Juan County, New Mexico; east of Greyhill Spring Quadrangle; lat. 36 degrees 01 minutes 35 seconds N. and long. 108 degrees 24 minutes 35 seconds W., NAD 27.

A—0 to 1 inch: light yellowish brown (2.5Y 6/4) gravelly fine sandy loam, light olive brown (2.5Y 5/4) moist; very fine granular structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; 20 percent sandstone and siderite gravel; strongly effervescent; slightly alkaline (8.8); abrupt smooth boundary.

Btn—1 to 4 inches: light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; moderate coarse columnar structure; hard, very friable, slightly sticky and nonplastic; few very fine roots; few very fine irregular pores; few faint clay films on faces of peds and bridging sand grains; 1 percent gravel; slightly effervescent; very strongly alkaline (9.0); abrupt smooth boundary.

Btkn—4 to 8 inches: light yellowish brown (2.5Y 6/4) sandy clay loam, light olive brown (2.5Y 5/4) moist; weak coarse subangular blocky structure; very hard, firm,
moderately sticky and moderately plastic few very fine roots; few very fine irregular pores; few faint clay films on faces of peds; 1 percent gravel; slightly effervescent; fine calcium carbonate masses; strongly effervescent; strongly alkaline (8.8); abrupt smooth boundary.

Bk1—8 to 25 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak fine and medium subangular blocky structure; hard, friable, nonsticky and nonplastic; 5 percent gravel; very fine calcium carbonate masses; slightly effervescent; moderately alkaline (8.4); clear smooth boundary.

Bk2—25 to 44 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak very fine and fine subangular blocky structure; hard, friable, nonsticky and nonplastic; 5 percent gravel; very fine calcium carbonate masses; violently effervescent; moderately alkaline (8.2); clear smooth boundary.

Cr—44 inches; interbedded sandstone and shale bedrock.

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Depth to paralithic contact: 40 to 60 inches
Rock fragments: 0 to 10 percent gravel
Reaction: moderately to very strongly alkaline
Calcium carbonate equivalent: 0 to 5 percent
Gypsum: 0 to 10 percent
Salinity: EC of 0 to 4 dS/m
Sodicity: SAR of 13 to 30
Btn and Btkn horizons:
  Chroma: 4 or 6, dry or moist
  Texture: sandy clay loam, fine sandy loam or clay loam
Bk and By horizons:
  Chroma: 4 or 6, dry or moist
  Texture: clay loam, loam, fine sandy loam

Not all pedons have secondary gypsum.

Berland family

*Depth class:* very shallow or shallow
*Drainage class:* well
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)
*Geomorphic position:* side slopes above drainageways
*Parent material:* slope alluvium derived from sandstone
*Elevation:* 8,690 to 9,200 feet
*Slope:* 1 to 15 percent
*Climatic data:*
  Mean annual precipitation: 18 to 22 inches
  Mean annual air temperature: 40 to 43 degrees F
  Frost-free period: 80 to 110 days
*Taxonomic class:* Loamy, mixed, superactive, frigid Lithic Argiustolls

Typical Pedon

Berland family in an area of mapping unit Bikeyah-Berland families, 1 to 15 percent slopes; McKinley County, New Mexico; Chuska Peak Quadrangle; lat. 35 degrees 55 minutes 20 seconds N. and long. 108 degrees 49 minutes 29 seconds W., NAD 27.

A1—0 to 1 inch; dark grayish brown (10YR 4/2) loam, very dark grayish brown
Fort Defiance Area, Arizona and New Mexico

(10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine
and few fine and medium roots; noneffervescent; abrupt smooth boundary.

A2—1 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark
grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic;
common very fine and few fine and medium roots; 1 percent gravel; noneffervescent;
abrupt smooth boundary.

Bt—3 to 11 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark
brown (10YR 2/2) moist; weak medium subangular blocky; slightly hard, very friable,
slightly sticky and nonplastic; few very fine and fine roots; few faint clay films on faces
of peds; 1 percent gravel; noneffervescent; clear smooth boundary.

BC—11 to 15 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very
dark brown (10YR 2/2) moist; weak medium and coarse subangular blocky; soft, very
friable, nonsticky and nonplastic; few very fine and fine roots; noneffervescent; abrupt
wavy boundary.

R—15 inches; sandstone bedrock.

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Depth to lithic contact: 12 to 15 inches to sandstone
Rock fragments: 0 to 10 percent
Reaction: neutral or slightly alkaline
Calcium carbonate equivalent: none
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
  Value: 2 or 3 moist
  Chroma: 2 or 3, dry or moist

Bt horizon:
  Value: 3 or 4 dry, 2 to 4 moist
  Chroma: 2 to 4, dry or moist
  Texture: fine sandy loam, loam, sandy clay loam

Bettonnie Series

Depth class: very deep
Drainage class: well
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphologic position: drainageways and fan terraces
Parent material: eolian material and fan alluvium derived from sandstone
Elevation: 6,500 to 7,300 feet
Slope: 1 to 8 percent
Climatic data:
  Mean annual precipitation: 10 to 14 inches
  Mean annual air temperature: 50 to 53 degrees F
  Frost-free period: 120 to 150 days
Taxonomic class: Coarse-loamy, mixed, superactive, mesic Ustic Hapludolls

Typical Pedon

Bettonnie fine sandy loam in an area of mapping unit Doakum family-Bettonnie
complex, 1 to 8 percent slopes; Apache County, Arizona; Cornfields Quadrangle;
about 2 miles north of Cornfields; lat. 35 degrees 40 minutes 48 seconds N. and long.
109 degrees 41 minutes 00 seconds W., NAD 27.
A—0 to 2 inches; reddish yellow (5YR 6/6) fine sandy loam, reddish brown
(5YR 4/4) moist; single grain; loose, nonsticky and nonplastic; common very
fine roots; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth
boundary.

BA—2 to 7 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR
4/6) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and
nonplastic; many very fine roots; few very fine discontinuous tubular pores; violently
effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bt1—7 to 18 inches; reddish brown (5YR 5/4) fine sandy loam, yellowish red (5YR
4/6) moist; moderate fine angular blocky structure; soft, very friable, nonsticky and
nonplastic; many very fine and few fine roots; few very fine discontinuous tubular
pores; many faint clay films on faces of peds and lining of pores with bridging
between grains; violently effervescent; moderately alkaline (pH 8.2); clear smooth
boundary.

Bt2—18 to 32 inches; reddish brown (5YR 5/4) fine sandy loam, yellowish red
(5YR 4/6) moist; moderate medium angular blocky structure; slightly hard, very
friable, nonsticky and nonplastic; common very fine roots; common very fine
discontinuous tubular pores; many faint clay films on faces of peds and lining of pores
with bridging between grains; violently effervescent; moderately alkaline (pH 8.2);
clear smooth boundary.

C1—32 to 42 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR
4/6) moist; massive; slightly hard, very friable, nonsticky and nonplastic; strongly
effervescent; few fine calcium carbonate filaments; strongly alkaline (pH 8.6); gradual
smooth boundary.

C2—42 to 80 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR
4/6) moist; massive; soft, very friable, nonsticky and nonplastic; few fine calcium
carbonate filaments; strongly effervescent; strongly alkaline (pH 8.6).

Range in Characteristics

Particle-size control section: 5 to 15 percent clay
Reaction: moderately or strongly alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 10

A horizon:
  Chroma: 3 to 6, dry or moist

B horizon:
  Value: 4 to 6 dry, 4 or 5 moist
  Chroma: 4 or 6, dry or moist

C horizon:
  Hue: 5YR, 7.5YR

Bettonnie family

Depth class: moderately deep
Drainage class: well
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: dipslope on cuestas
Parent material: eolian material
Elevation: 6,300 to 7,000 feet
Slope: 1 to 8 percent
Climatic data:
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 130 to 150 days
Taxonomic class: Coarse-loamy, mixed, superactive, mesic Ustic Haplargids

Typical Pedon
Betonnie family in an area of mapping unit Betonnie-Bond families-Skyvillage complex, 3 to 8 percent slopes; McKinley County, New Mexico; Coyote Canyon Quadrangle; lat. 35 degrees 47 minutes 36 seconds N. and long. 108 degrees 34 minutes 24 seconds W., NAD 27.
A—0 to 4 inches; reddish yellow (7.5YR 6/8) loamy fine sand, strong brown (7.5YR 5/8) moist; weak fine subangular blocky; soft, very friable, nonsticky and nonplastic; common very fine and few fine roots; common very fine pores; non-effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.
Bt1—4 to 12 inches; strong brown (7.5YR 5/6) fine sandy loam, strong brown (7.5YR 4/6) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; many very fine and common medium roots; many very fine pores; noneffervescent; moderately alkaline (pH 8.2); clear smooth boundary.
Btk—12 to 36 inches; reddish yellow (7.5YR 6/6) loamy fine sand, strong brown (7.5YR 5/6) moist; weak fine subangular blocky structure; hard, very friable, nonsticky and nonplastic; few fine and common very fine roots; many very fine pores; common fine irregular filaments of calcium carbonate; slightly effervescent; moderately alkaline (pH 8.4); clear smooth boundary.
Ck—36 to 37 inches; yellow (10YR 8/6) fine sandy loam, yellow (10YR 7/6) moist; massive; slightly hard, very friable, nonsticky and nonplastic; violently effervescent; strongly alkaline (pH 9.0); abrupt smooth boundary.
R—37 inches; sandstone.

Range in Characteristics
Particle-size control section: 12 to 18 percent clay
Depth to lithic contact: 30 to 40 inches
Reaction: moderately or strongly alkaline
Calcium carbonate equivalent: 0 to 20 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none
A horizon:
Hue: 5YR, 7.5YR, 10YR
Value: 5 or 6 dry, 3 to 5 moist
Chroma: 4 to 8 dry, 3 to 8 moist
Texture: loamy fine sand, fine sandy loam
Bt and Btk horizons:
Hue: 5YR, 7.5YR
Value: 4 or 5 dry, 3 to 5 moist
Chroma: 4 or 6, dry or moist
Texture: fine sandy loam, loamy fine sand
C horizon:
Value: 5 to 8 dry, 4 to 7 moist
Chroma: 4 or 6, dry or moist
Texture: fine sandy loam, loamy fine sand
Bighams Series

Depth class: moderately deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderately)
Geomorphic position: plateaus and hills
Parent material: eolian deposits and alluvium
Elevation: 6,300 to 6,700 feet
Slope: 1 to 8 percent

Climatic data:
- Mean annual precipitation: 10 to 14 inches
- Mean annual air temperature: 50 to 52 degrees F
- Frost-free period: 120 to 150 days

Taxonomic class: Fine-loamy, mixed, superactive, mesic Ustic Haplocalcids

Typical Pedon

Bighams very fine sandy loam, 1 to 8 percent slopes, about 3 miles southwest-southwest of Keams Canyon; about 500 feet east and 2,800 feet south of the northwest corner of sec. 3, T. 27 N., R. 20 E.

A—0 to 2 inches; brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/2) moist; weak medium platy structure; soft, very friable, nonsticky and slightly plastic; common very fine roots; many very fine vesicular pores; slightly effervescent (3 percent calcium carbonate); mildly alkaline; abrupt smooth boundary.

Bw1—2 to 9 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; strongly effervescent (7 percent calcium carbonate); mildly alkaline; clear smooth boundary.

Bw2—9 to 17 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; violently effervescent (11 percent calcium carbonate); mildly alkaline; abrupt smooth boundary.

2Bk1—17 to 23 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and plastic; many very fine roots; few very fine tubular pores; many fine irregular lime accumulations; violently effervescent (25 percent calcium carbonate); mildly alkaline; clear smooth boundary.

2Bk2—23 to 35 inches; white (N 8/0) sandy clay loam, pinkish white (7.5YR 8/2) moist; weak medium subangular blocky structure; very hard, friable, moderately sticky and moderately plastic few very fine roots; few very fine tubular pores; many fine irregular lime accumulations; violently effervescent (30 percent calcium carbonate); mildly alkaline; abrupt smooth boundary.

3Cr—35 to 60 inches; thinly bedded sandstone and shale; few very fine roots oriented along plates.

Range in Characteristics

Particle-size control section: 10 to 25 percent clay
Depth to paralithic contact: 24 to 40 inches
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 15 to 40 percent
Gypsum: none
Salinity: none
Sodicity: none
EC: 0 to 2 dS/m
Bw horizons:
  Chroma: 2 to 4 moist

Bk horizons:
  Hue: 7.5YR to N (neutral)
  Value: 6 to 8 dry, 5 to 8 moist
  Chroma: 0 to 4 dry, 2 to 4 moist

**Bikeyah family**

*Depth class:* very deep  
*Drainage class:* somewhat poorly  
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)  
*Geomorphic position:* stream terraces on drainageways  
*Parent material:* slope alluvium derived from sandstone  
*Elevation:* 8,400 to 9,200 feet  
*Slope:* 1 to 15 percent  
*Climatic data:*  
  Mean annual precipitation: 18 to 22 inches  
  Mean annual air temperature: 40 to 43 degrees F  
  Frost-free period: 80 to 110 days  
*Taxonomic class:* Coarse-loamy, mixed, superactive, frigid Aquic Haplustolls

**Typical Pedon**

Bikeyah family in an area of mapping unit Bikeyah-Berland families, 1 to 15 percent slopes; McKinley County, New Mexico; Chuska Peak Quadrangle; lat. 35 degrees 55 minutes 25 seconds N. and long. 108 degrees 49 minutes 30 seconds W., NAD 27.

Oi—0 to 1 inch; black (10YR 2/1) moist; nonsticky and nonplastic; many very fine and fine roots; noneffervescent; abrupt smooth boundary.

A—1 to 15 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine and medium granular structure; soft, very friable, slightly sticky and nonplastic; many very fine, fine, and medium roots; noneffervescent; 1 percent gravel; neutral; abrupt smooth boundary.

Bw1—15 to 27 inches; dark gray (10YR 4/1) fine sandy loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots; noneffervescent; neutral; clear smooth boundary.

Bw2—27 to 39 inches; dark grayish brown (10YR 4/2) sandy loam; very dark brown (10YR 2/2) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; noneffervescent; neutral; abrupt smooth boundary.

Bw3—39 to 52 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak medium and coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots; noneffervescent; neutral; abrupt smooth boundary.

C—52 to 70 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; single grain structure; loose, nonsticky and nonplastic; noneffervescent; neutral.

**Range in Characteristics**

Particle-size control section: 9 to 18 percent clay  
Depth to seasonal high water table: 4 to 6 feet  
Calcium carbonate equivalent: none
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

Bw horizons:
   Chroma: 1 or 2 moist
   Texture: fine sandy loam, sandy loam

**Blancot family**

*Depth class:* very deep  
*Drainage class:* well  
*Slowest permeability:* 0.2 to 0.06 in/hr (moderately slow)  
*Geomorphic position:* fan terraces  
*Parent material:* fan alluvium derived from sandstone and shale  
*Elevation:* 6,500 to 7,500 feet  
*Slope:* 2 to 6 percent  
*Climatic data:*  
   - Mean annual precipitation: 10 to 14 inches  
   - Mean annual air temperature: 50 to 53 degrees F  
   - Frost-free period: 120 to 150 days  
*Taxonomic class:* Fine-loamy, mixed, superactive, mesic Ustic Haplargids

**Typical Pedon**

Blancot family in an area of mapping unit Blancot family-Chafin complex, 2 to 6 percent slopes; McKinley County, New Mexico; Tohatchi Quadrangle; lat. 35 degrees 47 minutes 23 seconds N. and long. 108 degrees 50 minutes 07 seconds W., NAD 27.

A—0 to 1 inch; light yellowish brown (2.5Y 6/3) loam, light olive brown (2.5Y 5/3) moist; weak very fine granular; soft, very friable, slightly sticky and slightly plastic; few very fine and fine roots; slightly effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Bw—1 to 18 inches; light yellowish brown (2.5Y 6/3) loam, light olive brown (2.5Y 5/3) moist; weak fine, medium, and coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few very fine and fine roots; slightly effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Bt1—18 to 54 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; weak fine and medium subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; few very fine and fine roots; common faint clay films on faces of peds; slightly effervescent; slightly alkaline (pH 7.4); abrupt smooth boundary.

Bt2—54 to 60 inches; light yellowish brown (2.5Y 6/3) clay, light olive brown (2.5Y 5/3) moist; weak fine and medium subangular blocky structure; very hard, firm, moderately sticky and moderately plastic; common distinct clay films on faces of peds; slightly effervescent; slightly alkaline (pH 7.4).

**Range in Characteristics**

- Particle-size control section: 20 to 30 percent  
- Rock fragments: 0 to 5 percent  
- Reaction: slightly or moderately alkaline  
- Calcium carbonate equivalent: 1 to 5 percent  
- Gypsum: none  
- Salinity: EC of 0 to 2 dS/m  
- Sodicity: SAR of 0 to 2
A horizon:
Hue: 2.5Y, 10YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 3 or 4, dry or moist

B horizon:
Hue: 2.5Y, 10YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 3 to 6, dry or moist
Texture: sandy clay loam, clay loam

Bluechief Series

Depth class: moderately deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: structural benches, fan terraces, and plateaus
Parent material: eolian material and slope alluvium over residuum derived from sandstone
Elevation: 5,300 to 5,800 feet
Slope: 1 to 10 percent
Climatic data:
  Mean annual precipitation: 6 to 10 inches
  Mean annual air temperature: 50 to 55 degrees F
  Frost-free period: 130 to 160 days
Taxonomic class: Coarse-loamy, mixed, superactive, mesic Typic Haplocalcids

Typical Pedon

Bluechief fine sandy loam, in an area map unit 343-Monue-Bluechief complex, 1 to 4 percent slopes; Apache County, Arizona; Standing Horse Mesa, about 5.5 miles southeast of Tes Nez lah; 1,350 feet east and 1,100 south of the northwest corner of sec. 15, T. 40 N., R. 25 E.; lat. 36 degrees 52 minutes 45 seconds N. and long. 109 degrees 39 minutes 20 seconds W., NAD 27.

A—0 to 2 inches; brown (7.5YR 5/3) fine sandy loam, brown (7.5YR 4/3) moist; weak fine granular; soft, very friable, nonsticky and nonplastic; common very fine roots; 2 percent gravel; violently effervescent; moderately alkaline; abrupt smooth boundary.

Bw—2 to 6 inches; brown (7.5YR 5/3) fine sandy loam, brown (7.5YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and few fine and medium roots; 3 percent gravel; violently effervescent; moderately alkaline; abrupt smooth boundary.

Bk1—6 to 14 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and few fine and medium roots; secondary calcium carbonates disseminated throughout horizon; 3 percent gravel; violently effervescent; moderately alkaline; abrupt smooth boundary.

Bk2—14 to 28 inches; pinkish white (5YR 8/2) sandy loam, light reddish brown (5YR 6/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; secondary calcium carbonates segregated in irregularly shaped accumulations on faces of peds and rock fragments; 10 percent gravel; violently effervescent; strongly alkaline; abrupt smooth boundary.

Bk3—28 to 30 inches; pink (5YR 7/3) gravelly sandy loam, light reddish brown (5YR 6/3) moist; weak coarse subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; secondary calcium carbonates segregated in irregularly
shaped accumulations on faces of peds and rock fragments; 20 percent gravel; violently effervescent; strongly alkaline; abrupt smooth boundary.

2R—30 inches; hard basalt bedrock.

**Range in Characteristics**

- Particle-size control section: 5 to 25 percent
- Depth to lithic contact: 20 to 40 inches
- Reaction: slightly to strongly alkaline
- Depth to calcic horizon: 6 to 14 inches
- Calcium carbonate equivalent: 0 to 40 percent
- Gypsum: none
- Salinity: EC of 0 to 2 dS/m
- Sodicity: SAR of 0 to 2

**A horizon:**
- Value: 5 or 6 dry, 4 or 5 moist
- Chroma: 4 or 6, dry or moist

**Bw horizon:**
- Hue: 7.5YR, 5YR
- Chroma: 4 or 6, dry or moist
- Texture: fine sandy loam, loam, sandy loam

**Bk horizons:**
- Hue: 10YR, 7.5YR
- Value: 6 to 8 dry, 5 to 7 moist
- Chroma: 2 to 4, dry or moist
- Rock fragments: 0 to 20 percent gravel

**Bond Series**

*Depth class:* shallow
*Drainage class:* well
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)
*Geomorphic position:* hills and ridges
*Parent material:* Eolian material and slope alluvium derived from sandstone
*Elevation:* 6,100 to 6,800 feet
*Slope:* 1 to 6 percent
*Climatic data:*
- Mean annual precipitation: 10 to 14 inches
- Mean annual air temperature: 50 to 53 degrees F
- Frost-free period: 120 to 150 days
*Taxonomic class:* Loamy, mixed, superactive, mesic Lithic Ustic Haplargids

**Typical Pedon**

Bond fine sandy loam in an area of mapping unit Doakum-Gapmesa-Bond complex, 1 to 6 percent slopes; Navajo County, Arizona; Great Spring Quadrangle; lat. 36 degrees 28 minutes 30 seconds N. and long. 110 degrees 23 minutes 19 seconds W., NAD 27

- A—0 to 1 inch; light brown (7.5YR 6/3) fine sandy loam, brown (7.5YR 4/3) moist; weak fine and medium granular structure; loose, very friable, nonsticky and nonplastic; common very fine roots; neutral (pH 7.2); abrupt smooth boundary.
- Bt1—1 to 4 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 4/4)
moist; weak coarse subangular blocky structure parting to moderate medium
subangular blocky; soft very friable, slightly sticky and slightly plastic; common very
fine roots; few faint clay films on faces of peds and surfaces along pores; neutral (pH
7.2); clear smooth boundary.

Bt2—4 to 12 inches; reddish brown (5YR 5/4) sandy clay loam, brown (7.5YR 4/3)
moist; weak medium prismatic structure parting to moderate fine and medium
subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very
fine roots; few very fine irregular pores; common distinct clay films on faces of peds; 1
percent gravel; neutral (pH 7.2); abrupt smooth boundary.

Bt3—2 to 16 inches; brown (7.5YR 4/3) sandy clay loam, brown (7.5YR 4/2) moist;
moderate coarse prismatic structure; hard, friable, slightly sticky and slightly plastic;
many very fine roots; few very fine irregular pores; common distinct clay films on
faces of peds; 1 percent gravel; slightly alkaline (pH 7.6); abrupt smooth boundary.

Btk—16 to 20 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4)
moist; moderate medium prismatic structure parting to moderate medium subangular
blocky; hard, friable, moderately sticky and moderately plastic; common very fine
roots; common distinct clay films on faces of peds; few fine masses and filaments of
carbonate; strongly effervescent; 3 percent gravel; moderately alkaline (pH 8.2); clear
smooth boundary.

R—20 inches; sandstone bedrock.

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Depth to bedrock: 10 to 20 inches
Rock fragments: average of 0 to 5 percent
Reaction: neutral to moderately alkaline
Calcium carbonate equivalent: 0 to 10 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A and Bt horizons:
  Hue: 5YR, 7.5YR, 10YR
  Value: 4 to 6 dry, 3 to 5 moist
  Chroma: 2 to 6, dry or moist
  Texture: fine sandy loam, loam, sandy clay loam

Btk horizon:
  Hue: 5YR, 7.5YR
  Value: 4 to 6 dry, 3 to 5 moist
  Chroma: 2 to 6, dry or moist
  Texture: fine sandy loam, loam, sandy clay loam

Bond family

Depth class: very shallow and shallow
Drainage class: well
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Geomorphic position: summits of mesas and plateaus
Parent material: eolian material and slope alluvium materials derived from sandstone
and shale
Elevation: 6,400 to 7,200 feet
Slope: 1 to 8 percent
Climatic data:
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 120 to 150 days

Taxonomic class: Loamy, mixed, superactive, mesic Lithic Ustic Haplargids

Typical Pedon
Bond family in an area of mapping unit Betonnie-Bond families-Skyvillage complex, 3 to 8 percent slopes; about 3 miles south of Coyote Canyon and 150 feet west of dirt road, T. 17 N., R. 17 W.; McKinley County, NM; Hard Ground Flats Quadrangle; lat. 35 degrees 43 minutes 40 seconds N. and long 108 degrees 36 minutes 17 seconds W., NAD 27.

A—0 to 1 inch; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; loose, slightly sticky and slightly plastic; common fine and very fine roots; few very fine pores; noneffervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Bw—1 to 6 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic common fine and very fine roots; few very fine pores; noneffervescent; slightly alkaline (pH 7.8); clear smooth boundary.

Bt1—6 to 11 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure parting to moderate very fine subangular blocky; hard, friable, moderately sticky and moderately plastic common fine and very fine roots; few very fine pores; few faint clay films on faces of peds and pore openings; noneffervescent; slightly alkaline (pH 7.8); clear smooth boundary.

Bt2—11 to 16 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure parting to moderate very fine subangular blocky; hard, firm, moderately sticky and moderately plastic few fine and very fine roots; few very fine irregular pores; common distinct clay films on faces of peds and pore openings; slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Btk—16 to 18 inches; reddish yellow (7.5YR 6/6) clay loam, strong brown (7.5YR 5/6) moist; weak fine subangular blocky structure; hard, firm, moderately sticky and moderately plastic few fine and very fine roots; few faint clay films on faces of peds; many coarse masses of secondary calcium carbonate; violently effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

R—18 inches; sandstone bedrock.

Range in Characteristics
Particle-size control section: 18 to 35 percent clay
Depth to lithic contact: 12 to 18 inches to sandstone
Reaction: neutral to moderately alkaline
Calcium carbonate equivalent: 0 to 5 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
Hue: 5YR, 7.5 YR, 10YR
Chroma: 4 or 6, dry or moist

Bt horizon:
Hue: 5YR, 7.5YR
Value: 4 to 6, dry or moist
Chroma: 4 or 6, dry or moist
Texture: sandy clay loam, loam, clay loam

**Brimhall family**

*Depth class:* deep  
*Drainage class:* well  
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)  
*Geomorphic position:* structural benches  
*Parent material:* eolian material and slope alluvium over residuum derived from sandstone  
*Elevation:* 5,800 to 6,400 feet  
*Slope:* 1 to 3 percent  
*Climatic data:*  
  - Mean annual precipitation: 6 to 10 inches  
  - Mean annual air temperature: 51 to 54 degrees F  
  - Frost-free period: 130 to 160 days  
*Taxonomic class:* Coarse-loamy, mixed, superactive, mesic Typic Calcigypsids  

**Typical Pedon**

Brimhall family in an area of mapping unit Brimhall family-Benally family-Hanksville association, 0 to 45 percent slopes; San Juan County, New Mexico; Great Bend Quadrangle; lat. 36 degrees 09 minutes 47 seconds N. and long. 108 degrees 34 minutes 47 seconds W., NAD 27.

A—0 to 2 inches; olive yellow (2.5Y 6/6) loamy fine sand, light olive brown (2.5Y 5/6) moist; weak very fine granular; loose, nonsticky and nonplastic; common very fine roots; very slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bw—2 to 10 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; slightly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk—10 to 22 inches; pale yellow (2.5Y 7/3) fine sandy loam, light yellowish brown (2.5Y 6/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; common very fine masses of calcium carbonate; 10 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bky—22 to 41 inches; pale yellow (2.5Y 7/4) gravelly fine sandy loam, light yellowish brown (2.5Y 6/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine masses of calcium carbonate; few very fine gypsum accumulations; 20 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

R—41 inches; sandstone.

**Range in Characteristics**

Particle-size control section: 8 to 18 percent clay  
Depth to lithic contact: 40 to 60 inches  
Rock fragments: 0 to 20 percent gravel  
Reaction: slightly or moderately alkaline  
Calcium carbonate equivalent: 0 to 10 percent  
Depth to calcic horizon: 2 to 16 inches  
Gypsum: 0 to 10 percent  
Depth to gypsic horizon: 16 to 35 inches
Salinity: EC of 0 to 2 dS/m  
Sodicity: SAR of 0 to 2  

A horizon:  
Hue: 10YR, 7.5YR, 2.5Y  
Value: 5 or 6 dry, 4 or 5 moist  
Chroma: 3 to 6, dry or moist  

Bw and Bk horizons:  
Hue: 10YR, 7.5YR, 2.5Y  
Value: 6 or 7 dry, 4 or 5 moist  
Chroma: 3 to 6, dry or moist  
Rock fragments: 0 to 20 percent gravel  

Bky horizon:  
Hue: 10YR, 7.5YR, 2.5Y  
Value: 7 or 8 dry, 4 to 7 moist  
Chroma: 2 to 5, dry or moist  

Burnswick Series  

Depth class: very deep  
Drainage class: well  
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)  
Geomorphic position: fan terraces  
Parent material: eolian material and fan alluvium derived from mudstone, shale, and sandstone  
Elevation: 4,800 to 6,200 feet  
Slope: 1 to 5 percent  
Climatic data:  
Mean annual precipitation: 6 to 10 inches  
Mean annual air temperature: 51 to 54 degrees F  
Frost-free period: 130 to 180 days  
Taxonomic class: Fine-loamy, mixed, superactive, mesic Typic Haplocambids  

Typical Pedon  

Burnswick fine sandy loam in an area of mapping unit Marcou family-Burnswick complex, 1 to 3 percent slopes; Navajo County, Arizona; Turkey Track Butte Quadrangle; about 1.5 miles southeast of Turkey Track Butte; lat. 35 degrees 11 minutes 25 seconds N. and long. 110 degrees 09 minutes 10 seconds W., NAD 27.  
A—0 to 2 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 4/3) moist; moderate very fine granular structure; soft, loose, nonsticky and slightly plastic; common very fine roots; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.  

Bw1—2 to 11 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 5/3) moist; weak medium angular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; common very fine discontinuous tubular pores; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.  

Bw2—11 to 22 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; strong coarse subangular blocky structure; moderately hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine discontinuous tubular pores; strongly effervescent; strongly alkaline (pH 8.4); abrupt smooth boundary.  

Bkn1—22 to 30 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish
brown (5YR 5/4) moist; strong coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine discontinuous tubular pores; few very fine masses of calcium carbonate; violently effervescent; strongly alkaline (pH 8.8); clear smooth boundary.

Bkn2—30 to 54 inches; light reddish brown (5YR 6/4) clay loam, reddish brown (5YR 5/4) moist; weak course angular blocky structure; hard, friable, moderately sticky and moderately plastic; few very fine discontinuous tubular pores; few very fine masses of calcium carbonate; strongly effervescent; very strongly alkaline (pH 9.2); abrupt smooth boundary.

BCn—54 to 80 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; massive; moderately hard, very friable, slightly sticky and slightly plastic; 5 percent gravel; strongly effervescent; very strongly alkaline (pH 9.2).

### Range in Characteristics

<table>
<thead>
<tr>
<th>Particle-size control section</th>
<th>20 to 35 percent clay</th>
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<td>SAR of 0 to 30</td>
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</tbody>
</table>

**A horizon:**
- Hue: 5YR, 7.5YR
- Value: 5 or 6 dry, 4 or 5 moist
- Chroma: 3 or 4, dry or moist
- Rock fragments: 5 to 25 percent gravel

**Bw and Bkn horizons:**
- Value: 5 or 6 dry, 4 or 5 moist
- Chroma: 3 or 4, dry or moist
- Texture: sandy clay loam, clay loam

**BCn horizon:**
- Value: 5 to 7 dry, 4 to 6 moist
- Chroma: 2 to 4, dry or moist
- Texture: sandy loam, sandy clay loam, clay loam

### Chafin Series

*Depth class:* very deep  
*Drainage class:* well  
*Slowest permeability:* 0.06 to 0.2 in/hr (slow)  
*Geomorphic position:* fan terraces  
*Parent material:* fan alluvium derived from sandstone and shale  
*Elevation:* 6,500 to 7,500 feet  
*Slope:* 2 to 4 percent  
*Climatic data:*  
- Mean annual precipitation: 10 to 14 inches  
- Mean annual air temperature: 50 to 53 degrees F  
- Frost-free period: 120 to 150 days  
*Taxonomic class:* Fine, mixed, superactive, mesic Ustic Haplargids

#### Typical Pedon

Chafin clay loam in an area of mapping unit Blancot family-Chafin complex, 2 to 6
percent slopes; McKinley County, New Mexico; Tohatchi Quadrangle; lat. 35 degrees 47 minutes 19 seconds N. and long. 108 degrees 49 minutes 58 seconds W., NAD 27.

A—0 to 1 inch; pale yellow (2.5Y 7/3) clay loam, light olive brown (2.5Y 5/3) moist; weak fine granular structure; slightly hard, friable, slightly sticky and moderately plastic; common very fine and fine roots; very slightly effervescent; slightly alkaline (pH 7.6); abrupt smooth boundary.

Bt1—1 to 8 inches; pale yellow (2.5Y 7/3) clay, light olive brown (2.5Y 5/3) moist; weak fine, medium, and coarse subangular blocky structure; hard, friable, moderately sticky and very plastic; few very fine and fine roots; common distinct clay films on faces of peds; very slightly effervescent; slightly alkaline (pH 7.6); abrupt smooth boundary.

Bt2—8 to 32 inches; light yellowish brown (2.5Y 6/3) clay, olive brown (2.5Y 4/3) moist; weak very fine and fine subangular blocky structure; very hard, firm, moderately sticky and very plastic; few very fine and fine roots; common distinct clay films on faces of peds; very slightly effervescent; slightly alkaline (pH 7.6); clear smooth boundary.

C1—32 to 55 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; weak fine and medium subangular blocky structure and massive; slightly hard, friable, slightly sticky and very plastic; very slightly effervescent; slightly alkaline (pH 7.6); abrupt smooth boundary.

C2—55 to 60 inches; pale yellow (2.5Y 7/3) loamy sand, light olive brown (2.5Y 5/3) moist; massive; loose, very friable, nonsticky and nonplastic; very slightly effervescent; slightly alkaline (pH 7.6).

Range in Characteristics

Particle-size control section: 35 to 50 percent clay
Reaction: slightly to strongly alkaline
Calcium carbonate equivalent: 0 to 5 percent
Depth to carbonates: 13 to 28 inches or more
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2

A horizon:
Hue: 2.5Y, 10YR
Value: 5 to 7 dry, 3 to 5 moist
Chroma: 2 to 4, dry or moist
Texture: fine sandy loam, sandy clay loam, clay

Bt horizons:
Hue: 2.5Y, 10YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 2 to 4, dry or moist
Texture: fine sandy loam, sandy clay loam, clay, sandy loam, clay loam

Chinchin family

Depth class: shallow
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: summits of buttes and mesas
Parent material: eolian material and slope alluvium derived from sandstone, shale, and volcanic rock
Elevation: 6,000 to 7,300 feet
Slope: 3 to 8 percent

Climatic data:
- Mean annual precipitation: 10 to 14 inches
- Mean annual air temperature: 50 to 53 degrees F
- Frost-free period: 120 to 150 days

Taxonomic class: Loamy, mixed, superactive, mesic Lithic Calciargids

Typical Pedon

Chinchin family in an area of mapping unit Flaco-Chinchin family complex, 1 to 8 percent slopes; Greasewood Spring Quadrangle; Navajo County, Arizona; lat. 35 degrees 28 minutes 05 seconds N. and long. 109 degrees 58 minutes 47 seconds W., NAD 27.

A—0 to 2 inches; brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots throughout; 2 percent gravel; noneffervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bt1—2 to 7 inches; brown (7.5YR 5/4) loam, brown (7.5YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots throughout; common very fine discontinuous tubular pores; many continuous distinct clay films on faces of peds and in pores; 2 percent gravel; strongly effervescent; moderately alkaline (pH 8.2), clear smooth boundary.

Bt2—7 to 11 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and moderately plastic; common very fine and few fine roots throughout; common very fine discontinuous tubular pores; many distinct clay films on faces of peds and in pores; 5 percent gravel; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Btk—11 to 16 inches; light brown (7.5YR 6/3) sandy clay loam, brown (7.5YR 5/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and moderately plastic; common very fine roots throughout; common very fine discontinuous tubular pores; many distinct clay films on faces of peds and in pores; common very fine calcium carbonate masses and coatings on sides and bottoms of coarse fragments; 5 percent angular basalt gravel and 5 percent angular basalt cobbles; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk—16 to 19 inches; light brown (7.5YR 6/3) gravelly sandy loam, brown (7.5YR 5/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots throughout; common very fine calcium carbonate masses and coatings on sides and bottoms of coarse fragments; 15 percent angular basalt gravel and 10 percent angular basalt cobbles; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

2R—19 inches; hard basalt bedrock.

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Depth to lithic contact: 10 to 20 inches to sandstone
Rock fragments: 0 to 15 percent gravel, 0 to 10 percent cobbles
Calcium carbonate equivalent: 0 to 25 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2
A horizon:
  Value: 4 or 5 dry, 3 or 4 moist
  Chroma: 3 or 4, dry or moist
  Texture: very fine sandy loam, loam

Bt and Btk horizons:
  Chroma: 3 or 4, dry or moist
  Texture: loam, sandy clay loam

Bk horizon:
  Value: 4 or 5 moist
  Chroma: 3 or 4, dry or moist
  Texture: sandy clay loam, sandy loam, loam

Chipeta family

Depth class: very shallow to shallow
Drainage class: well
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Geomorphic position: escarpments and side slopes of hills
Parent material: slope alluvium over residuum derived from shale
Elevation: 5,800 to 6,500 feet
Slope: 2 to 35 percent
Climatic data:
  Mean annual precipitation: 6 to 10 inches
  Mean annual air temperature: 51 to 54 degrees F
  Frost-free period: 130 to 160 days

Taxonomic class: Clayey, mixed, active, calcareous, mesic, shallow Typic Torriorthents

Typical Pedon

Chipeta family in an area of mapping unit Farb-Chipeta family-Rock outcrop complex, 2 to 30 percent slopes; San Juan County, New Mexico; east of Greyhill Spring Quadrangle; sec. 34, T.21N., R.15W.; lat. 36 degrees 00 minutes 59 seconds N. and long. 108 degrees 25 minutes 14 seconds W., NAD 27.

A—0 to 2 inches; light olive brown (2.5Y 5/3) gravelly clay loam, olive brown (2.5Y 4/3) moist; moderate very fine granular structure; soft, friable, very sticky and very plastic; few very fine roots; 2 percent cobbles and 30 percent gravel; strongly effervescent; moderately alkaline (8.0); abrupt smooth boundary.

Bw—2 to 8 inches; light olive brown (2.5Y 5/3) clay, olive brown (2.5Y 4/3) moist; weak coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; many very fine roots; strongly effervescent; moderately alkaline (8.0); clear smooth boundary.

Cr—8 inches; shale bedrock.

Range in Characteristics

Particle-size control section: 35 to 50 percent clay
Depth to lithic contact: 6 to 11 inches to shale
Rock fragments: 0 to 30 percent gravel and cobbles
Calcium carbonate equivalent: 0 to 5 percent
Gypsum: 5 to 10 percent
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2
A horizon:
   Hue: 10YR, 2.5Y
   Value: 5 or 6 dry, 3 or 4 moist
   Chroma: 1 to 3, dry or moist

B and C horizons:
   Hue: 10YR, 2.5Y
   Value: 3 to 5 dry, 3 or 4 moist
   Chroma: 1 to 3, dry or moist
   Texture: silty clay, clay
   Other features: 0 to 30 percent soft shale fragments

**Claysprings family**

*Depth class:* very shallow to shallow  
*Drainage class:* well  
*Slowest permeability:* 0.2 to 0.6 in/hr (moderately slow)  
*Geomorphic position:* side slopes of hills and ridges and escarpments of mesas and plateaus  
*Parent material:* residuum from shale  
*Elevation:* 5,400 to 6,200 feet  
*Slope:* 1 to 60 percent  
*Climatic data:*  
   Mean annual precipitation: 6 to 10 inches  
   Mean annual air temperature: 51 to 56 degrees F  
   Frost-free period: 130 to 160 days  
*Taxonomic class:* Clayey, smectitic, calcareous, mesic, shallow Typic Torriorthents  

**Typical Pedon**

Claysprings family in an area map unit 325—Badland-Claysprings family complex, 3 to 60 percent slopes; Navajo County, Arizona; Five Buttes Quadrangle; about 4 miles southeast of Black Butte; lat. 35 degrees 15 minutes 34 seconds N. and long. 110 degrees 02 minutes 50 seconds W., NAD 27.

A—0 to 2 inches; reddish brown (2.5YR 5/4) gravelly clay loam, reddish brown (2.5YR 4/4) moist; moderate fine granular structure, slightly hard, very friable, moderately sticky and moderately plastic; few very fine roots; 20 percent soft mudstone gravel; strongly effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.

C—2 to 11 inches; reddish brown (2.5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; moderate medium prismatic structure parting to fine angular blocky; moderately hard, friable, moderately sticky and moderately plastic; common very fine roots; few very fine discontinuous tubular pores; strongly effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.

Cr—11 inches; soft red shale.

**Range in Characteristics**

Particle-size control section: 35 to 60 percent clay  
Depth to paralithic contact: 6 to 13 inches to shale  
Rock fragments: 0 to 20 percent gravel  
Reaction: moderately or strongly alkaline  
Calcium carbonate equivalent: 0 to 10 percent  
Gypsum: 0 to 2 percent  
Salinity: EC of 1 to 16 dS/m
Sodicity: SAR of 0 to 13

A horizon:
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 4 to 7 dry, 3 or 4 moist
- Chroma: 2 to 6, dry or moist

C horizon:
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 4 to 7 dry, 3 to 6 moist
- Chroma: 2 to 6, dry or moist
- Texture: clay loam, silty clay, clay

Cumulic Endoaquolls

Depth class: very deep
Drainage class: poorly
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Geomorphic position: flood plains
Parent material: stream alluvium derived from sandstone and shale
Elevation: 7,500 to 8,200 feet
Slope: 0 to 2 percent
Climatic data:
- Mean annual precipitation: 18 to 22 inches
- Mean annual air temperature: 40 to 43 degrees F
- Frost-free period: 80 to 110 days
Taxonomic class: Cumulic Endoaquolls

Typical Pedon

Cumulic Endoaquolls in an area of mapping unit Sponseller family-Cumulic Endoaquolls complex, 0 to 5 percent slopes; San Juan County, New Mexico; about 7.5 miles southwest of Two Grey Hills Trading Post in the Soil Survey of Shiprock Area, Arizona and New Mexico; 1,000 feet north and 850 feet east of the southwest corner of sec. 15, T. 22 N., R. 19 W.; lat. 36 degrees 8 minutes 9 seconds N. and long. 108 degrees 51 minutes 35 seconds W., NAD 27.

A1—0 to 7 inches; dark gray (7.5YR 4/1) silt loam, black (7.5YR 2.5/1) moist; weak fine granular; soft, very friable, slightly sticky and slightly plastic; many very fine and few coarse roots; noneffervescent; neutral; abrupt smooth boundary.

A2—7 to 39 inches; dark gray (7.5YR 4/1) silty clay loam, black (7.5YR 2.5/1) moist; weak medium and coarse subangular blocky structure; hard, firm, moderately sticky and very plastic; few very fine and fine roots; noneffervescent; neutral; clear smooth boundary.

C1—39 to 47 inches; gray (7.5YR 5/1) clay, very dark gray (7.5YR 3/1) moist; massive; very hard, firm, very sticky and very plastic; few very fine and fine roots; noneffervescent; slightly alkaline; abrupt smooth boundary.

C2—47 to 60 inches; brown (7.5YR 4/2) clay, very dark brown (7.5YR 2.5/2) moist; massive; very hard, firm, very sticky and very plastic; few very fine and fine roots; noneffervescent; neutral.

Range in Characteristics

Particle-size control section: 20 to 35 percent clay
Rock fragment content: less than 10 percent gravel
Depth to base of mollic epipedon: 25 to 35 inches
Calcium carbonate equivalent: 5 to 10 percent
Reaction: neutral or slightly alkaline
Depth to seasonal high water table: 1.0 to 2.0 feet
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none
C horizons:
   Value: 2.5 or 3 moist
   Texture: silty loam, silty clay loam, and clay

Deza Series

Depth class: very deep
Drainage class: somewhat excessively
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: stable landslides
Parent material: slope alluvium derived from sandstone
Elevation: 8,000 to 8,600 feet
Slope: 5 to 15 percent
Climatic data:
   Mean annual precipitation: 18 to 22 inches
   Mean annual air temperature: 40 to 43 degrees F
   Frost-free period: 80 to 110 days
Taxonomic class: Sandy, mixed, frigid Lamellic Haplustalfs

Typical Pedon

Deza fine sand in an area of mapping unit Narbona family-Deza complex, 5 to 50 percent slopes, McKinley County, New Mexico; Chuska Peak Quadrangle; lat. 35 degrees 56 minutes 33 seconds N. and long. 108 degrees 50 minutes 38 seconds W., NAD 27.

A—0 to 4 inches; brown (10YR 5/3) fine sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; many very fine and fine roots; noneffervescent; slightly acid; abrupt smooth boundary.

E1—4 to 18 inches; brown (10YR 5/3) fine sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; 1 percent gravel; noneffervescent; clear smooth boundary.

E2—18 to 31 inches; brown (10YR 5/3) fine sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; common very fine roots; noneffervescent; slightly acid; clear smooth boundary.

E/Bt—31 to 65 inches; brownish yellow (10YR 6/6) loamy fine sand (E part), yellowish brown (10YR 5/6) moist, with pale brown (10YR 6/3) loamy fine sand lamellae (Bt part), pale brown (10YR 6/3) moist; single grain; loose, nonsticky and nonplastic; lamellae; noneffervescent; slightly acid.

Range in Characteristics

Particle-size control section: 2 to 10 percent clay
Rock fragments: 0 to 2 percent
Reaction: moderately acid to neutral
Depth to argillic horizon: 22 to 68 inches (where lamellae are more than 1 cm thick)
Lamellae: thin lamellae at depths above 80 inches
Calcium carbonate equivalent: none
Gypsum: none
Salinity: EC of 0 to 1 dS/m
Sodicity: none

A horizon:
- Hue: 7.5YR, 10YR
- Value: 3 to 6 dry, 3 to 5 moist
- Chroma: 1 to 3, dry or moist
- Texture: fine sand, loamy fine sand

E horizon:
- Hue: 7.5YR, 10YR
- Value: 5 to 7 dry, 3 to 7 moist
- Chroma: 2 or 3, dry or moist
- Texture: fine sand, loamy fine sand

E/Bt horizons:
- Hue: 7.5YR, 10YR
- Value: 5 to 7 dry, 4 to 7 moist
- Chroma: 2 to 6, dry or moist
- Texture: loamy fine sand, fine sand
- Other features: some pedons have upper subhorizons with few, very thin lamellae less than 1 cm thick

Doakum Series

- Depth class: very deep
- Drainage class: well
- Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
- Geomorphic position: drainageways, fan terraces, hills, and ridges
- Parent material: fan and slope alluvium derived from sandstone and shale
- Elevation: 6,100 to 7,200 feet
- Slope: 1 to 8 percent
- Climatic data:
  - Mean annual precipitation: 10 to 14 inches
  - Mean annual air temperature: 50 to 53 degrees F
  - Frost-free period: 120 to 150 days
- Taxonomic class: Fine-loamy, mixed, superactive, mesic Ustic Haplargids

Typical Pedon

Doakum fine sandy loam in an area of mapping unit Doakum-Gapmesa-Bond complex, 1 to 6 percent slopes; McKinley County, New Mexico; Twin Lakes Quadrangle; lat. 35 degrees 40 minutes 05 seconds N. and long. 108 degrees 48 minutes 39 seconds W., NAD 27.

- A—0 to 2 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; noneffervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

- Bt1—2 to 6 inches; brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; weak medium and coarse subangular blocky structure; hard, friable, moderately sticky and moderately plastic common very fine and fine roots; few very fine irregular pores; few distinct clay films on faces of peds and lining of pores; noneffervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

- Bt2—6 to 15 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, friable,
moderately sticky and moderately plastic common very fine, fine, and medium roots; few very fine pores; few faint clay films on faces of peds and lining pores; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Btk—15 to 30 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic few very fine and fine roots; few faint clay films on faces of peds and lining pores; common very fine masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Bk1—30 to 45 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic few very fine roots; few faint clay films on faces of peds and lining pores; common very fine masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk2—45 to 70 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; hard, friable, moderately sticky and moderately plastic; few very fine masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.0).

**Range in Characteristics**

Particle-size control section: 18 to 35 percent clay
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 0 to 5 percent
Gypsum: 0 to 1 percent
Salinity: EC of 0 to 2 dS/m
Sodicity: none

Bt and Btk horizons:
- Hue: 7.5YR, 10YR
- Value: 4 to 6 dry, 4 or 5 moist

Bk horizon:
- Value: 5 or 6, dry or moist
- Texture: sandy clay loam, loam

**Doakum family**

*Depth class:* very deep
*Drainage class:* well
*Slowest permeability:* 0.2 to 0.6 in/hr (moderately slow)
*Geomorphic position:* drainageways, fan terraces, and summits of mesas and plateaus
*Parent material:* eolian material and fan alluvium derived from sandstone and shale
*Elevation:* 6,000 to 7,300 feet
*Slope:* 1 to 15 percent
*Climatic data:*
  - Mean annual precipitation: 10 to 14 inches
  - Mean annual air temperature: 50 to 53 degrees F
  - Frost-free period: 120 to 150 days
*Taxonomic class:* Fine-loamy, mixed, superactive, mesic Ustic Haplargids

**Typical Pedon**

Doakum family in an area of mapping unit Doakum-Betonnie families complex, 1 to
5 percent slopes; Apache County, Arizona; Ganado Mesa SW Quadrangle; about 6.5 miles north of Cornfields; lat. 35 degrees 45 minutes 30 seconds N. and long. 109 degrees 38 minutes 00 seconds W., NAD 27.

A—0 to 3 inches; reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; weak fine granular structure; soft, loose, slightly sticky and slightly plastic; common very fine roots; violently effervescent; strongly alkaline (pH 8.2); abrupt smooth boundary.

Bt1—3 to 9 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; moderate fine subangular blocky structure; moderately hard, friable, slightly sticky and moderately plastic; many very fine roots; few very fine discontinuous tubular pores; many continuous faint clay films on faces of peds and lining pores; 1 percent gravel; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bt2—9 to 12 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; moderate fine angular blocky structure; moderately hard, very friable, slightly sticky and moderately plastic; many very fine roots; few very fine discontinuous tubular pores; many continuous distinct clay films on faces of peds and lining pores; 1 percent gravel; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Btk—12 to 21 inches; light reddish brown (5YR 6/3) clay loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and moderately plastic; many very fine roots; few very fine and fine discontinuous tubular pores; many continuous distinct clay films on faces of peds and lining pores; few fine masses of calcium carbonates; 1 percent gravel; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk—21 to 32 inches; light reddish brown (5YR 6/4) loam, reddish brown (5YR 5/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and few fine roots; few very fine discontinuous tubular pores; few fine masses of calcium carbonate and on bottom of coarse fragments; 5 percent gravel; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C1—32 to 56 inches; reddish brown (5YR 5/4) loam; reddish brown (5YR 5/4; massive; slightly hard, very friable, slightly sticky and nonplastic; violently effervescent; moderately alkaline (pH 8.4); clear smooth boundary.

C2—56 to 80 inches; brown (7.5YR 5/4) loam; reddish brown (2.5YR 5/4) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; violently effervescent; moderately alkaline (pH 8.4).

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Rock fragments: 0 to 5 percent
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 0 to 5 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2

A horizon:
Hue: 5YR, 7.5YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 2 to 4, dry or moist
Texture: fine sandy loam, loam, clay loam

Bt and Btk horizons:
Hue: 5YR, 7.5YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 2 to 4, dry or moist
Texture: sandy clay loam, clay loam, loam

Bk horizons:
Hue: 5YR, 7.5YR
Value: 5 to 7 dry, 4 or 5 moist
Chroma: 3 to 6, dry or moist
Texture: sandy clay loam, loam, fine sandy loam
Calcium carbonate equivalent: less than 15 percent

C horizon:
Hue: 2.5YR, 5YR, 7.5YR
Value: 5 to 7 dry, 4 or 5 moist
Chroma: 3 to 6, dry or moist
Texture: fine sandy loam, loam, loamy fine sand

**Eagleye Series**

*Depth class:* very shallow and shallow
*Drainage class:* well
*Slowest permeability:* 0.06 to 0.2 in/hr (slow)
*Geomorphic position:* escarpments of mesas and plateaus and side slopes of hills and ridges
*Parent material:* colluvium and residuum derived from sandstone and shale
*Elevation:* 6,300 to 7,400 feet
*Slope:* 2 to 70 percent
*Climatic data:*
  - Mean annual precipitation: 10 to 14 inches
  - Mean annual air temperature: 50 to 53 degrees F
  - Frost-free period: 120 to 150 days
*Taxonomic class:* Clayey, mixed, active, nonacid, mesic, shallow Ustic Torriorthents

**Typical Pedon**

Eagleye clay loam in an area of mapping unit Rock outcrop-Eagleye-Teesto family complex, 35 to 70 percent slopes; McKinley County, New Mexico; Twin Lakes Quadrangle; 108 47 44 N., 35 41 15 W., NAD 27.

- A—0 to 3 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak fine granular; soft, friable, moderately sticky and moderately plastic many fine and medium roots; common very fine discontinuous pores; abrupt smooth boundary.
- C—3 to 12 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; massive; hard, friable, moderately sticky and moderately plastic common medium roots; few fine discontinuous pores; clear smooth boundary.
- Cr—12 inches; weathered shale.

**Range in Characteristics**

- Particle-size control section: 35 to 50 percent clay
- Depth to lithic contact: 6 to 18 inches to shale
- Rock fragments: 0 to 25 percent
- Reaction: moderately alkaline (pH 7.9 to 8.4)
- Calcium carbonate equivalent: none
- Gypsum: 0 to 5 percent
- Salinity: EC of 0 to 4 dS/m
Soil Survey
Sodicity: SAR of 0 to 10

A horizon:
  Hue: 10YR, 2.5Y
  Value: 4 or 5 moist
  Chroma: 2 to 4, dry or moist
  Clay percent: 28 to 40 percent

B or C horizons:
  Hue: 10YR, 2.5Y
  Value: 3 to 5 moist
  Chroma: 2 to 4, dry or moist
  Texture: clay, clay loam, silty clay

Esolendo Series

Depth class: very shallow
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: escarpments and side slopes of hills and ridges
Parent material: colluvium and residuum derived from sandstone and shale
Elevation: 5,200 to 6,600 feet
Slope: 35 to 70 percent
Climatic data:
  Mean annual precipitation: 10 to 14 inches
  Mean annual air temperature: 50 to 53 degrees F
  Frost-free period: 120 to 150 days
Taxonomic class: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents

Typical Pedon

Esolendo gravelly sandy clay loam in an area of mapping unit Kinusta family-
Esolendo-Rock outcrop complex, 15 to 70 percent slopes; Apache County, Arizona;
Greasewood Quadrangle; about 3.3 miles east of Greasewood Trading Post; lat. 35
degrees 30 minutes 40 seconds N. and long. 109 degrees 47 minutes 56 seconds
W., NAD 27.
  A—0 to 2 inches; light yellowish brown (7.5YR 6/4) gravelly sandy clay loam, light
brown (7.5YR 6/3) moist; weak fine granular structure; soft, very friable, slightly sticky
and moderately plastic; 20 percent gravel; violently effervescent; moderately alkaline
(8.2); abrupt smooth boundary.
  C—2 to 7 inches; very pale brown (10YR 7/3) gravelly sandy clay loam, pale brown
(10YR 6/3) moist; weak fine subangular blocky structure; slightly hard, very friable,
slightly sticky and moderately plastic; many very fine roots; 20 percent gravel;
violely effervescent; moderately alkaline (8.2); clear smooth boundary.
  Cr—7 inches; soft shale bedrock.

Range in Characteristics

Particle-size control section: averages 25 to 35 percent clay
Depth to lithic contact: 5 to 10 inches to shale
Rock fragments: average of 15 to 25 percent gravel
Calcium carbonate equivalent: 0 to 5 percent
Gypsum: 0 to 1 percent
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 1 to 5
A horizon:
- Hue: 7.5YR, 10YR
- Value: 6 or 7 dry, 5 or 6 moist
- Chroma: 3 or 4, dry or moist

C horizon:
- Hue: 7.5YR, 10YR
- Value: 5 to 7 dry, 5 or 6 moist
- Chroma: 3 or 4, dry or moist
- Texture: sandy clay loam, fine sandy loam, loamy sand

**Evpark Series**

*Depth class:* moderately deep  
*Drainage class:* well  
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)  
*Geomorphic position:* summits of mesas and plateaus  
*Parent material:* eolian material and slope alluvium derived from sandstone and shale  
*Elevation:* 6,300 to 7,800 feet  
*Slope:* 1 to 8 percent  
*Climatic data:*  
  - Mean annual precipitation: 14 to 18 inches  
  - Mean annual air temperature: 48 to 51 degrees F  
  - Frost-free period: 110 to 140 days  
*Taxonomic class:* Fine-loamy, mixed, superactive, mesic Ardic Hapludalfs

**Typical Pedon**

Evpark fine sandy loam in an area of mapping unit Evpark-Vessilla-Arabrab complex, 1 to 25 percent slopes; Apache County, Arizona; Big Willow Spring Canyon Quadrangle; about 4.4 miles north of Beshbto Rest Area; lat. 35 degrees 49 minutes 54 seconds N. and long. 109 degrees 58 minutes 21 seconds W., NAD 27.

- **A**—0 to 3 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 3/3) moist; weak medium granular structure; soft, loose, slightly sticky and slightly plastic; common very fine roots; noneffervescent; slightly alkaline (pH 7.6); abrupt smooth boundary.
- **Bt1**—3 to 11 inches; brown (7.5YR 5/3) sandy clay loam, brown (7.5YR 4/3) moist; strong medium angular blocky structure; moderately hard, very friable, slightly sticky and slightly plastic; many very fine roots; common very fine discontinuous tubular pores; many distinct clay films on faces of peds and lining pores; noneffervescent; slightly alkaline (pH 7.6); abrupt smooth boundary.
- **Bt2**—11 to 23 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; strong medium angular blocky structure; hard, very friable, moderately sticky and moderately plastic; common very fine roots; many very fine discontinuous tubular pores; many distinct clay films on faces of peds and lining pores; strongly effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.
- **Btk1**—23 to 32 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; weak medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine discontinuous tubular pores; few distinct clay films on faces of peds; many very fine filaments of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.
- **Btk2**—32 to 36 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and
slightly plastic; calcium carbonate coats all sides of coarse fragments; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

2R—36 inches; hard sandstone bedrock.

Range in Characteristics

Particle-size control section: 20 to 35 percent clay and greater than 35 percent sand
Depth to lithic contact: 20 to 40 inches to sandstone
Rock fragments: 0 to 10 percent gravel
Reaction: neutral or slightly alkaline in the surface, neutral to moderately alkaline in the subsoil
Calcium carbonate equivalent: 0 to 5 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
  Hue: 7.5YR, 10YR
  Value: 4 or 5 dry, 3 or 4 moist
  Chroma: 3 or 4, dry or moist

Bt horizons:
  Hue: 5YR, 7.5YR
  Value: 4 or 5 dry, 3 to 5 moist
  Chroma: 3 or 4, dry or moist
  Texture: sandy clay loam, clay loam

Btk horizon (when present):
  Hue: 5YR, 7.5YR
  Value: 4 to 6 dry, 4 or 5 moist
  Chroma: 4 or 6, dry or moist

Some pedons have a Bk horizon above the lithic contact.

Fajada Series

Depth class: moderately deep
Drainage class: well
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Geomorphic position: erosional remnants on plateaus
Parent material: alluvium over residuum derived from sandstone and shale
Elevation: 5,800 to 6,500 feet
Slope: 1 to 5 percent
Climatic data:
  Mean annual precipitation: 6 to 10 inches
  Mean annual air temperature: 51 to 54 degrees F
  Frost-free period: 130 to 160 days
Taxonomic class: Fine-loamy, mixed, superactive, mesic Typic Natrargids

Typical Pedon

Fajada gravelly fine sandy loam in an area of mapping unit Fajada-Huerfano-Benally family complex, 1 to 5 percent slopes; San Juan County, New Mexico, east of Grey Hill Spring Quadrangle; lat. 36 degrees 02 minutes 17 seconds N. and long. 108 degrees 23 minutes 50 seconds W., NAD 27.

A—0 to 2 inches; light yellowish brown (2.5Y 6/4) gravelly fine sandy loam, light olive brown (2.5Y 5/4) moist; weak very fine granular structure; slightly hard, very
Friable, nonsticky and nonplastic; few very fine roots; 20 percent gravel; slightly effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.

Btn—2 to 6 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak fine subangular blocky structure; hard, friable, nonsticky and nonplastic; few very fine roots; few very fine irregular pores; common prominent clay films on faces of peds and bridging between sand grains; strongly effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.

Btkny—6 to 15 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak fine subangular blocky structure; very hard, friable, nonsticky and nonplastic; few very fine roots; few very fine irregular pores; few distinct clay films on faces of peds; common very fine calcium carbonate masses and few very fine masses of gypsum; strongly effervescent; strongly alkaline (pH 8.8); clear smooth boundary.

BCky—15 to 26 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak fine subangular blocky structure; hard, friable, nonsticky and nonplastic; few very fine roots; few very fine calcium carbonate masses and few very fine masses of gypsum; slightly effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.

Cr—26 inches; soft sandstone interbedded with soft shale.

Range in Characteristics

Particle-size control section: 18 to 35 percent clay and greater than 35 percent sand
Depth to paralithic contact: 20 to 36 inches to interbedded soft sandstone and shale
Reaction: moderately to very strongly alkaline
Calcium carbonate equivalent: 1 to 5 percent
Gypsum content: 1 to 10 percent
Salinity: EC of 0 to 4 dS/m
Sodicity: SAR of 13 to 30

A horizon:
- Hue: 10YR, 2.5Y
- Value: 5 to 7 dry, 4 or 5 moist
- Chroma: 4 or 6, dry or moist
- Rock fragments: 0 to 30 percent sandstone gravel

Btn and Btkny horizons:
- Hue: 10YR, 2.5Y
- Value: 4 to 6 dry, 4 or 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: fine sandy loam, clay loam, sandy clay loam, very fine sandy loam.

BCky horizon:
- Hue: 10YR, 2.5Y
- Value: 5 or 6, dry, 4 or 5 moist
- Chroma: 4, dry or moist
- Texture: clay loam, fine sandy loam.

Some pedons have E horizons.

Farb Series

Depth class: very shallow to shallow
Drainage class: well
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: summits of mesas and plateau dipslopes
Parent material: slope alluvium over residuum derived from sandstone

Elevation: 5,800 to 6,500 feet

Slope: 2 to 30 percent

Climatic data:
- Mean annual precipitation: 6 to 10 inches
- Mean annual air temperature: 51 to 54 degrees F
- Frost-free period: 130 to 160 days

Taxonomic class: Loamy, mixed, superactive, calcareous, mesic Lithic Torriorthents

Typical Pedon

Farb very gravelly loam in an area of mapping unit Farb-Chipeta family-Rock outcrop complex, 2 to 30 percent slopes; San Juan County, New Mexico; east of Grey Hill Springs Quadrangle; lat. 36 degrees 00 minutes 58 seconds N. and long. 108 degrees 25 minutes 14 seconds W., NAD 27.

A—0 to 2 inches; light yellowish brown (2.5Y 6/4) very gravelly loam, light olive brown (2.5Y 5/4) moist; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; 5 percent stones, 15 percent cobbles, and 25 percent gravel; strongly effervescent; moderately alkaline (8.0); abrupt smooth boundary.

C—2 to 9 inches; olive yellow (2.5Y 6/6) sandy loam, light olive brown (2.5Y 5/6) moist; massive structure; soft, very friable, nonsticky and nonplastic; few very fine roots; strongly effervescent; moderately alkaline (8.0); abrupt smooth boundary.

R—9 inches; sandstone bedrock.

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Depth to lithic contact: 9 to 17 inches
Rock fragments: 0 to 30 percent
Reaction: slightly to strongly alkaline
Calcium carbonate equivalent: 0 to 5 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
- Hue: 2.5Y, 10YR
- Value: 5 to 7 dry, 4 or 5 moist
- Chroma: 3 or 4, dry or moist
- Texture: loam, fine sandy loam, loam, loamy fine sand, sandy loam

B and C horizons:
- Hue: 2.5Y, 10YR
- Value: 5 to 8 dry, 4 to 6 moist
- Chroma: 3 to 6, dry or moist
- Texture: fine sandy loam, loamy fine sand, sandy loam

Flaco Series

Depth class: moderately deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: summits of buttes and mesas
Parent material: eolian material and slope alluvium derived from sandstone and volcanic rock
Elevation: 6,000 to 7,300 feet
Slope: 1 to 4 percent
Climatic data:
  - Mean annual precipitation: 10 to 14 inches
  - Mean annual air temperature: 50 to 53 degrees F
  - Frost-free period: 120 to 150 days
Taxonomic class: Fine-loamy, mixed, superactive, mesic Ustic Calciargids

Typical Pedon
Flaco fine sandy loam in an area of mapping unit Flaco-Chinchin family complex, 1 to 8 percent slopes; located on Wood Chop Mesa, Navajo County, Arizona; Indian Wells Quadrangle; lat. 35 degrees, 26 minutes, 14 seconds N; long. 110 degrees, 02 minutes, 25 seconds W., NAD 27.

A—0 to 2 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bt—2 to 10 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and moderately plastic; many very fine and few fine roots; few very fine discontinuous tubular pores; common patchy distinct clay films on faces of peds; violently effervescent; moderately alkaline (pH 8.2), clear smooth boundary.

Btk1—10 to 22 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/3) moist; strong medium angular blocky structure; hard, friable, slightly sticky and moderately plastic; many very fine roots; few very fine discontinuous tubular pores; many continuous distinct clay films on faces of peds and in pores; few fine calcium carbonate masses and filaments; violently effervescent; moderately alkaline (pH 8.2), clear smooth boundary.

Btk2—22 to 26 inches; pink (5YR 7/4) sandy clay loam, reddish brown (5YR 5/4) moist; weak medium angular blocky structure; hard, friable, slightly sticky and moderately plastic; common faint clay films on faces of peds; common fine calcium carbonate masses and filaments; few very fine discontinuous tubular pores; common fine calcium carbonate masses and filaments; 5 percent gravel; violently effervescent; moderately alkaline (pH 8.4), abrupt smooth boundary.

Bk—26 to 32 inches; pink (5YR 7/3) sandy loam, reddish brown (5YR 5/3) moist; massive; hard, firm, slightly sticky and slightly plastic; common fine calcium carbonate masses and filaments; 5 percent gravel; violently effervescent; moderately alkaline (pH 8.4), abrupt smooth boundary.

2R—32 inches; hard basalt bedrock.

Range in Characteristics
Particle-size control section: 18 to 35 percent clay
Depth to lithic contact: 20 to 40 inches
Rock fragments: 0 to 15 percent
Reaction: moderately or strongly alkaline
Calcium carbonate equivalent: 0 to 5 percent in the surface and 15 to 20 percent in the subsoil
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
  - Hue: 5YR, 7.5YR
  - Value: 3 to 5, dry or moist
  - Chroma: 3 or 4, dry or moist
Bt horizon:
  Hue: 5YR, 7.5YR  
  Value: 4 or 5 dry, 3 or 4 moist  
  Chroma: 3 or 4, dry or moist  
  Texture: loam, sandy clay loam, clay loam

Btk horizon:
  Hue: 5YR, 7.5YR  
  Value: 5 to 7 dry, 4 to 6 moist  
  Chroma: 3 or 4, dry or moist  
  Texture: fine sandy loam, sandy clay loam

Bk horizon:
  Hue: 5YR, 7.5YR, 10YR  
  Value: 4 to 7 dry, 4 to 6 moist  
  Chroma: 3 to 6, dry or moist  
  Texture: clay loam, sandy loam, loam

**Flutedrock Series**

*Depth class:* very deep  
*Drainage class:* well  
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)  
*Geomorphic position:* breaks, escarpments of plateaus, and side slopes of hills and ridges  
*Parent material:* eolian material and slope alluvium over residuum derived from sandstone  
*Elevation:* 7,500 to 8,000 feet  
*Slope:* 5 to 60 percent  
*Climatic data:*  
  - Mean annual precipitation: 18 to 22 inches  
  - Mean annual air temperature: 46 to 48 degrees F  
  - Frost-free period: 110 to 130 days  
*Taxonomic class:* Loamy, mixed, superactive, nonacid, mesic Lithic Ustorthents

**Typical Pedon**

Flutedrock fine sandy loam in an area of mapping unit Verite-Rock outcrop-Flutedrock complex, 5 to 60 percent slopes; Apache County, Arizona; west of Window Rock Quadrangle; lat. 35 degrees 41 minutes 52 seconds N. and long. 109 degrees 11 minutes 51 seconds W., NAD 27.

A—0 to 2 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure parting to moderate fine granular; soft, loose, nonsticky and nonplastic; many very fine roots throughout; many very fine vesicular pores; 2 percent gravel; noneffervescent; neutral (pH 6.8); abrupt smooth boundary.

C1—2 to 8 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/3) moist; weak medium subangular blocky structure; moderately hard, very friable, nonstikcy and nonplastic; many very fine roots; common very fine discontinuous tubular pores; 2 percent gravel; noneffervescent; neutral (pH 7.0); clear smooth boundary.

C2—8 to 14 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; massive; slightly hard, loose, nonstikcy and nonplastic; common very fine and few fine roots; 2 percent gravel; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.

R—14 inches; hard sandstone bedrock.
Range in Characteristics

- Particle-size control section: 5 to 25 percent clay
- Depth to lithic contact: 6 to 24 inches to sandstone
- Rock fragments: 0 to 10 percent gravel
- Calcium carbonate equivalent: none
- Gypsum: none
- Salinity: EC of 0 to 2 dS/m
- Sodicity: none

A and C horizons:
- Hue: 5YR, 7.5YR
- Value: 4 to 7 dry, 3 to 6 moist
- Chroma: 2 to 6, dry or moist
- Texture: sandy loam, fine sandy loam, sandy clay loam, loamy fine sand, loam

Fraguni Series

- Depth class: very deep
- Drainage class: somewhat excessively
- Slowest permeability: 0.6 to 2.0 in/hr (moderate)
- Geomorphic position: summits of mesas and plateaus
- Parent material: eolian material and slope alluvium derived from sandstone
- Elevation: 6,500 to 7,500 feet
- Slope: 1 to 8 percent
- Climatic data:
  - Mean annual precipitation: 14 to 18 inches
  - Mean annual air temperature: 48 to 51 degrees F
  - Frost-free period: 110 to 140 days
- Taxonomic class: Coarse-loamy, mixed, superactive, mesic Aridic Haplustalfs

Typical Pedon

Fraguni loamy fine sand in an area of mapping unit Parkelei family-Fraguni complex, 1 to 8 percent slopes; McKinley County, New Mexico; Chafin Well Quadrangle; lat. 35 degrees, 14 minutes, 24 seconds N. and long. 109 degrees, 02 minutes, 44 seconds W., NAD 27.

A—0 to 2 inches; brown (7.5YR 5/2) loamy fine sand, brown (7.5YR 4/2) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; noneffervescent; slightly alkaline (pH 7.4); abrupt smooth boundary.

Bt—2 to 14 inches; brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few faint clay films on faces of peds and bridging sand grains; noneffervescent; slightly alkaline (pH 7.4); abrupt smooth boundary.

BC1—14 to 30 inches; brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; noneffervescent; slightly alkaline (pH 7.4); clear smooth boundary.

BC2—30 to 38 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; noneffervescent; slightly alkaline (7.4); clear smooth boundary.

BC3—38 to 45 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; weak very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; noneffervescent; slightly alkaline (7.4); abrupt smooth boundary.
Bk—45 to 60 inches; brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) moist; weak very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; slightly effervescent; slightly alkaline (7.4).

**Range in Characteristics**

Particle-size control section: 3 to 20 percent clay, greater than 35 percent sand  
Reaction: slightly or moderately alkaline  
Calcium carbonate equivalent: 0 to 5 percent  
Gypsum content: none  
Salinity: EC of 0 to 2 dS/m  
Sodicity: none

A horizon:  
Hue: 7.5YR, 10YR  
Value: 5 or 6 dry, 4 or 6 moist  
Chroma: 2 or 3, dry or moist

Bt horizon:  
Hue: 5YR, 7.5YR, 10YR  
Value: 4 or 5 dry  
Chroma: 2 or 3 dry, 3 or 4 moist  
Texture: fine sandy loam, sandy loam

BC horizon:  
Hue: 5YR, 7.5YR  
Texture: loamy fine sand, fine sandy loam, sandy clay loam

Some pedons have a Btk horizon.

**Fruitland Series**

*Depth class*: very deep  
*Drainage class*: somewhat excessively  
*Slowest permeability*: 0.6 to 2.0 in/hr (moderate)  
*Geomorphic position*: stream terraces  
*Parent material*: eolian material and stream alluvium derived from sandstone and shale  
*Elevation*: 5,800 to 6,300 feet  
*Slope*: 1 to 5 percent  
*Climatic data*:  
  Mean annual precipitation: 6 to 10 inches  
  Mean annual air temperature: 51 to 54 degrees F  
  Frost-free period: 130 to 160 days  
*Taxonomic class*: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents

**Typical Pedon**

Fruitland loamy fine sand in an area of mapping unit Benally family-Fruitland association, 1 to 5 percent slopes; San Juan County, New Mexico; east of Grey Hill Spring Quadrangle; lat. 36 degrees 01 minutes 34 seconds N. and long. 108 degrees 24 minutes 34 seconds W., NAD 27.  
A—0 to 1 inch; light yellowish brown (2.5Y 6/4) loamy fine sand, light olive brown (2.5Y 5/4) moist; single grain; loose, nonsticky and nonplastic; few very fine and
fine roots; violently effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

C1—1 to 17 inches; light yellowish brown (2.5Y 6/4) loamy fine sand, light olive brown (2.5Y 5/4) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; violently effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C2—17 to 34 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Ck1—34 to 45 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few very fine calcium carbonate masses; 1 percent gravel; slightly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Ck2—45 to 50 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, moderately sticky and moderately plastic; few very fine roots; few very fine calcium carbonate masses; slightly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Ck3—50 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine calcium carbonate masses; slightly effervescent; moderately alkaline (pH 8.2).

Range in Characteristics

Particle-size control section: 5 to 15 percent clay
Rock fragments: 0 to 1 percent
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 1 to 5 percent
Gypsum content: 0 to 1 percent
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 5

A horizon:
   Hue: 2.5Y, 10YR
   Chroma: 2 or 4, dry or moist

C horizons:
   Hue: 2.5Y or 10YR
   Value: 5 or 6 dry
   Chroma: 3 or 4, dry or moist
   Texture: fine sandy loam, clay loam, loamy fine sand, silty loam.

Gapmesa Series

Depth class: moderately deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: hills and ridges
Parent material: eolian material and slope alluvium derived from sandstone
Elevation: 6,100 to 6,800 feet
Slope: 1 to 6 percent
Climatic data:
   Mean annual precipitation: 10 to 14 inches
   Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

*Taxonomic class:* Fine-loamy, mixed, superactive, mesic Ustic Haplargids

**Typical Pedon**

Gapmesa fine sandy loam in an area of mapping unit Doakum-Gapmesa-Bond complex, 1 to 6 percent slopes; McKinley County, New Mexico; Twin Lakes Quadrangle; lat. 35 degrees 40 minutes 04 seconds N. and long. 108 degrees 48 minutes 38 seconds W., NAD 27.

A—0 to 2 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak very fine granular; soft, very friable, nonsticky and nonplastic; few very fine roots; 1 percent gravel and 1 percent cobbles; noneffervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Bt—2 to 7 inches; brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; weak, medium and coarse subangular blocky; hard, friable, moderately sticky and moderately plastic; common very fine and fine roots; few very fine irregular pores; few distinct clay films on faces of peds; noneffervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Btk—7 to 22 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; common very fine and fine roots; few very fine irregular pores; few faint clay films on faces of peds; common very fine masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Bk—22 to 28 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; hard, friable, moderately sticky and moderately plastic; few very fine roots; many very fine masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

R—28 inches; sandstone bedrock.

**Range in Characteristics**

Particle-size control section: averages 18 to 26 percent clay
Depth to lithic contact: 20 to 28 inches
Rock fragments: 0 to 2 percent
Reaction: slightly alkaline in the upper part and moderately alkaline in the lower part
Calcium carbonate equivalent: 0 to 5 percent
Gypsum content: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

Bt and Btk horizons:
  Value: 5 or 6 dry
  Texture: fine sandy loam, loam, sandy clay loam

**Gish Series**

*Depth class:* very deep
*Drainage class:* well
*Slowest permeability:* 0.06 to 0.2 in/hr (slow)
*Geomorphic position:* stream terraces on valley floors
*Parent material:* stream alluvium derived from sandstone and shale
*Elevation:* 6,100 to 6,800 feet
Slope: 0 to 2 percent

Climatic data:
- Mean annual precipitation: 10 to 14 inches
- Mean annual air temperature: 50 to 53 degrees F
- Frost-free period: 120 to 150 days

Taxonomic class: Fine, mixed, superactive, mesic Ustic Haplocambids

Typical Pedon

Gish silt loam in an area of mapping unit Querencia and Gish soils, 0 to 2 percent slopes; McKinley County, New Mexico; Window Rock Quadrangle; lat. 35 degrees 39 minutes 43 seconds N. and long. 109 degrees 01 minutes 19 seconds W., NAD 27.

A—0 to 4 inches; light olive brown (2.5Y 5/3) silt loam, olive brown (2.5Y 4/3) moist; moderate very fine granular; soft, very friable, slightly sticky and slightly plastic; few very fine roots; 1 percent gravel; noneffervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bw—4 to 20 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; very hard, very firm, moderately sticky and moderately plastic; few very fine roots; slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bk1—20 to 30 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, moderately sticky and moderately plastic; few very fine roots; few very fine masses of calcium carbonate; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Bk2—30 to 35 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, moderately sticky and moderately plastic; few very fine masses of calcium carbonate; slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bky—35 to 47 inches; light olive brown (2.5Y 5/3) silty clay loam, olive brown (2.5Y 5/4) moist; massive; very hard, very firm, moderately sticky and moderately plastic; few very fine masses of calcium carbonate and gypsum; slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C—47 to 70 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; slightly effervescent; moderately alkaline (pH 8.0).

Range in Characteristics

Particle-size control section: 35 to 60 percent clay
Rock fragments: 0 to 5 percent
Calcium carbonate equivalent: 0 to 10 percent
Depth to calcium carbonate: 10 to 30 inches
Gypsum: 0 to 10 percent
Salinity: EC of 0 to 4 dS/m
Sodicity: SAR of 1 to 10

A horizon:
- Value: 2 or 5 dry, 3 to 5 moist
- Chroma: 1 to 3, dry or moist
- Textures: clay, clay loam, silty loam

Bw horizon:
- Value: 3 to 5, dry or moist
- Chroma: 2 or 3, dry or moist
- Textures: clay, silty clay loam
Bk and C horizons:
Value: 4 to 6 dry, 4 or 5 moist
Chroma: 3 or 4, dry or moist
Textures: clay loam, fine sandy loam, sandy clay loam, silty clay loam

Gish family

Depth class: very deep
Drainage class: well
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Geomorphic position: fan terraces
Parent material: fan alluvium derived from shale
Elevation: 6,100 to 7,200 feet
Slope: 1 to 8 percent
Climatic data:
  Mean annual precipitation: 10 to 14 inches
  Mean annual air temperature: 50 to 53 degrees F
  Frost-free period: 120 to 150 days
Taxonomic class: Fine, mixed, superactive, mesic Ustic Haplocambids

Typical Pedon

Gish family in an area of mapping unit Gish-Mentmore families complex, 1 to 8 percent slopes; McKinley County, New Mexico; Surrender Canyon Quadrangle; lat. 35 degrees 24 minutes 27 seconds N. and long. 109 degrees 02 minutes 52 seconds W., NAD 27.

A—0 to 2 inches; light yellowish brown (2.5Y 6/3) loam, dark grayish brown (2.5Y 4/2) moist; surface crust above weak very fine granular structure; soft, very friable, moderately sticky and moderately plastic; few very fine roots; very slightly effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Bw1—2 to 12 inches; light yellowish brown (2.5Y 6/3) clay loam, dark grayish brown (2.5Y 4/2) moist; weak thin platy and weak medium and coarse subangular blocky structure; slightly hard, very friable, moderately sticky and moderately plastic; few fine and medium roots; very slightly effervescent; slightly alkaline (pH 7.8); abrupt wavy boundary.

Bw2—12 to 20 inches; light yellowish brown (2.5Y 6/3) clay, dark grayish brown (2.5Y 4/2) moist; weak fine and coarse subangular blocky structure; very hard, extremely firm, very sticky and very plastic; few very fine roots; very slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bk1—20 to 52 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak fine and medium angular blocky structure; very hard, extremely firm, very sticky and very plastic; slightly effervescent; few very fine masses of calcium carbonate; slightly alkaline (pH 7.8); abrupt smooth boundary.

Bk2—52 to 60 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak fine and medium angular blocky structure; very hard, extremely firm, very sticky and very plastic; strongly effervescent; few very fine masses of calcium carbonate; slightly alkaline (pH 7.8).

Range in Characteristics

Particle-size control section: 35 to 50 percent clay
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum content: 0 to 5
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 5
Bw horizon:
  Chroma: 2 or 3, dry or moist
  Texture: clay, clay loam.

**Grieta family**

*Depth class:* very deep  
*Drainage class:* well  
*Slowest permeability:* 2 to 6 (moderately rapid)  
*Geomorphic position:* fan terraces  
*Parent material:* sandstone and mudstone  
*Elevation:* 4,800 to 5,500  
*Slope:* 1 to 12  
*Climatic data:*  
  - Mean annual precipitation: 6 to 10 inches  
  - Mean annual air temperature: 53 to 56  
  - Frost-free period: 150 to 180  
*Taxonomic class:* Fine-loamy, mixed, superactive, mesic Typic Calciargids

**Typical Pedon**

Grieta family in an area of mapping unit Grieta family, 3 to 10 percent slopes; about 17 miles east of Holbrook, about 1,200 feet west and 400 feet north of the southeast corner of sec. 2, T. 18 N., R. 23 E.

A—0 to 3 inches; reddish brown (5YR 5/3) sandy loam, reddish brown (5YR 4/4) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Bt—3 to 11 inches; reddish brown (5YR 5/3) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; common very fine tubular pores; few faint clay films lining pores and bridging sand grains; strongly effervescent; moderately alkaline (pH 8.2); clear wavy boundary.

Btk1—11 to 20 inches; reddish brown (5YR 5/4) sandy clay loam, yellowish red (5YR 4/6) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; few faint clay films on faces of peds, lining pores, and bridging sand grains; strongly effervescent; few fine soft irregularly shaped white calcium carbonate masses; moderately alkaline (pH 8.2); clear wavy boundary.

Btk2—20 to 27 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; weak moderate prismatic structure parting to weak fine subangular blocky; hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; few faint clay films on faces of peds; strongly effervescent; common soft irregularly shaped (10YR 8/2) calcium carbonate masses; moderately alkaline (pH 8.2); clear wavy boundary.

Bk—27 to 44 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; massive hard, very friable, slightly sticky and slightly plastic, very few very fine roots; common very fine tubular pores; violently effervescent; many fine soft irregularly shaped (10YR 8/2) calcium carbonate masses; moderately alkaline (pH 8.2).

C—44 to 60 inches; light reddish brown (5YR 6/4) sandy loam, yellowish red (5YR 4/6) moist; massive; hard, very friable; common very fine tubular pores; strongly effervescent; moderately alkaline (pH 8.2).
Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Rock fragments: 0 to 10 percent
Depth to calcic horizon: 20 to 40 inches
Calcium carbonate equivalent: 5 to 30 percent, greater than 15 percent in the calcic horizon
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
Hue: 5YR, 7.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 3 to 6, dry or moist

Bt and Btk horizons:
Hue: 5YR, 7.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 3 to 6, dry or moist
Texture: sandy clay loam, clay loam

Bk and C horizons:
Hue: 5YR, 7.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: sandy clay loam, sandy loam

Hanksville Series

*Depth class:* moderately deep
*Drainage class:* well
*Slowest permeability:* 0.06 to 0.2 in/hr (slow)
*Geomorphic position:* escarpments and erosional remnants
*Parent material:* slope alluvium over residuum derived from sandstone and shale
*Elevation:* 5,800 to 6,500 feet
*Slope:* 15 to 60 percent
*Climatic data:*
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days
*Taxonomic class:* Fine, mixed, superactive, calcareous, mesic Typic Torriorthents

Typical Pedon

Hanksville gravelly clay loam in an area of mapping unit Brimhall family-Benally family-Hanksville association, 0 to 45 percent slopes; San Juan County, New Mexico; Great Bend Quadrangle; lat. 36 degrees 09 minutes 57 seconds N. and long. 108 degrees 34 minutes 49 seconds W., NAD 27.

A—0 to 2 inches; light yellowish brown (2.5Y 6/4) gravelly clay loam, light olive brown (2.5Y 5/4) moist; moderate very fine granular structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine roots; 16 percent gravel; slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bk—2 to 8 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; moderate medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; common very fine roots; few fine masses of
calium carbonate; strongly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Ck—8 to 16 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; massive; very hard, firm, moderately sticky and moderately plastic; few very fine roots; few fine and medium masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Cky—16 to 21 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, moderately sticky and moderately plastic; few very fine roots; few very fine masses of calcium carbonate; very few gypsum crystals; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Cr—21 inches; shale.

**Range in Characteristics**

Particle-size control section: 35 to 55 percent clay
Depth to paralithic contact: 20 to 27 inches to soft bedrock
Calcium carbonate equivalent: 0 to 3 percent
Gypsum: 0 to 5 percent
Salinity: EC of 2 to 16
Sodicity: SAR of 5 to 30

A horizon:
- Hue: 7.5YR, 10YR, 2.5Y

B horizon:
- Hue: 10YR, 2.5Y
- Value: 4 or 5 moist
- Chroma: 2 to 4, dry or moist
- Texture: clay loam, clay
- Reaction: moderately or strongly alkaline
- Rock fragments: 0 to 15 percent

C horizon:
- Hue: 7.5YR, 10YR, 2.5Y
- Chroma: 2 to 4, dry or moist
- Texture: silty clay loam, clay loam, clay
- Reaction: slightly acid to moderately alkaline
- Rock fragments: 0 to 5 percent

**Haplogypsids soils**

*Depth class:* deep and very deep
*Drainage class:* excessively drained
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)
*Parent material:* alluvium and colluvium derived from mixed sources high in gypsum
*Slope:* 5 to 60 percent
*Climatic data:*
  - Mean annual precipitation: 6 to 10 inches
  - Mean annual air temperature: 51 to 54 degrees F
  - Frost-free period: 130 to 160 days
*Taxonomic class:* Haplogypsids

**Typical Pedon**

The following soil is illustrative of the Haplogypsids in an area of Haplogypsids-Torriorthents association, 5 to 60 percent slopes, about 5 miles west of Holbrook,
about 200 feet south and 800 feet east of the northwest corner of sec. 29, T. 18 N., R. 20 E.

A—0 to 1 inch; reddish brown (5YR 5/4) very gravelly loam, reddish brown (5YR 4/4) moist; weak thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine and very fine vesicular pores; 55 percent gravel; slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

A2—1 to 3 inches; reddish brown (5YR 5/4) very gravelly loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; common fine and very fine tubular pores; 55 percent gravel; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Bw—3 to 8 inches; reddish brown (5YR 5/4) gravelly clay loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; common fine and very fine tubular and irregular pores; 30 percent gravel; slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

2Bky1—8 to 14 inches; olive yellow (2.5Y 6/6) very gravelly sandy clay loam, light olive brown (2.5Y 5/6) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; common fine and very fine tubular pores; 50 percent gravel; many fine and medium white masses of gypsum crystals; strongly effervescent, 13 percent calcium carbonate equivalent; slightly alkaline (pH 7.8); clear smooth boundary.

2Bky2—14 to 20 inches; light brownish gray (2.5Y 6/2) gravelly clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common fine and very fine tubular pores; 30 percent gravel; many fine and medium white masses of gypsum crystals; horizontal strata of crystalline gypsum that are 2 centimeters thick at base of horizon; common calcium carbonate coatings on rock fragments; strongly effervescent, 7 percent calcium carbonate equivalent; slightly alkaline (pH 7.8); abrupt smooth boundary.

3By—20 to 27 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium angular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine roots; few fine and very fine tubular and irregular pores; 5 percent fine gravel; common fine and medium masses of white gypsum crystals; slightly effervescent, 3 percent calcium carbonate equivalent; slightly alkaline (pH 7.6); abrupt smooth boundary.

4By—27 to 33 inches; light yellowish brown (2.5Y 6/4) very gravelly sandy clay, olive brown (2.5Y 4/4) moist; massive; hard, friable, moderately sticky and moderately plastic; few fine and very fine roots; common fine and very fine tubular pores; 40 percent gravel; common fine and medium masses of white gypsum crystals; slightly effervescent; slightly alkaline (pH 7.6); clear smooth boundary.

5By—33 to 60 inches; variegated yellow, pale yellow, and yellowish red (2.5Y 7/6 and 7/4 and 2/5YR 4/6) stratified very gravelly sand, olive yellow, olive brown, and dark red (2.5Y 6/6 and 2.5Y 4/4 and 2.5YR 3/6) moist; massive; few fine and very fine roots; many fine and very fine irregular pores; common thin and medium strata of coarser and finer materials; 45 percent gravel; common strata of gypsum crystals that are 2 to 3 centimeters thick; common fine and medium masses of gypsum crystals; noneffervescent; slightly alkaline (pH 7.6).

**Range in Characteristics**

Haplogypsids soils are highly variable in regard to the physical and chemical properties that can be observed throughout the survey area.
Hawaiikuh Series

Depth class: very deep
Drainage class: well
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Geomorphic position: fan remnants on valley sides and stream terraces on valley floors
Parent material: fan and stream alluvium derived from sandstone and shale
Elevation: 6,000 to 6,400 feet
Slope: 1 to 5 percent
Climatic data:
  Mean annual precipitation: 10 to 14 inches
  Mean annual air temperature: 50 to 53 degrees F
  Frost-free period: 120 to 150 days
Taxonomic class: Fine, mixed, superactive, mesic Ustic Haplargids

Typical Pedon

Hawaiikuh silt loam in an area of mapping unit Aquima-Hawaiikuh silt loams, 1 to 5 percent slopes; Apache County, Arizona; Lupton Quadrangle; lat. 35 degrees 15 minutes 19 seconds N. and long. 109 degrees 03 minutes 46 seconds W., NAD 27.

A—0 to 2 inches; red (2.5YR 4/6) silt loam, dark red (2.5YR 3/6) moist; moderate very fine granular structure; soft, very friable, moderately sticky and moderately plastic; common very fine and fine roots; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bt—2 to 11 inches; reddish brown (2.5YR 4/4) silty clay, dark reddish brown (2.5YR 3/4) moist; strong fine and medium subangular blocky structure; very hard, very firm, moderately sticky, moderately plastic; common very fine and fine roots; few very fine irregular pores; common distinct clay films on faces of peds; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Btk1—11 to 20 inches; reddish brown (2.5YR 4/4) clay loam, dark reddish brown (2.5YR 3/4) moist; moderate fine and medium subangular blocky structure; very hard, firm, moderately sticky and moderately plastic; few very fine roots; few very fine irregular pores; few faint clay films on faces of peds; few very fine masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Btk2—20 to 25 inches; reddish brown (2.5YR 4/4) clay loam, dark reddish brown (2.5YR 3/4) moist; weak fine and medium subangular blocky structure; very hard, very firm, moderately sticky and moderately plastic; few very fine masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.0).

Bk1—25 to 50 inches; red (2.5YR 4/6) silty clay loam, dark red (2.5YR 3/6) moist; weak medium subangular blocky structure; very hard, very firm, moderately sticky and moderately plastic; few very fine masses of calcium carbonate; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk2—50 to 70 inches; red (2.5YR 4/6) silty clay, dark red (2.5YR 3/6) moist; weak medium subangular blocky structure; very hard, very firm, moderately sticky and moderately plastic; few very fine masses of calcium carbonate; violently effervescent; moderately alkaline (pH 8.2).

Range in Characteristics

Particle-size control section: 35 to 60 percent clay
Calcium carbonate equivalent: 0 to 10 percent
Gypsum: none
Salinity: EC of 0 to 4 dS/m
Sodicity: SAR of 0 to 2

A horizon:
  Hue: 2.5YR, 5YR, 10YR
  Value: 3 to 5, dry or moist
  Chroma: 4 or 6, dry or moist
  Texture: silty clay loam, clay loam

Bt and Btk horizons:
  Hue: 2.5YR, 5YR, 10YR
  Value: 4 to 6 dry, 3 to 5 moist
  Texture: silty clay loam, clay loam, clay

Bk horizons:
  Hue: 2.5YR, 5YR, 10YR
  Value: 3 to 7 moist, 4 to 7 dry
  Chroma: 3 to 6, dry or moist
  Texture: loamy very fine sand, very fine sandy loam, fine sandy loam, sandy clay loam, clay loam, clay

Hosta Series

Depth class: very deep
Drainage class: well
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Geomorphic position: drainageways and stream terraces
Parent material: stream alluvium derived from sandstone and shale
Elevation: 6,900 to 7,500 feet
Slope: 3 to 8 percent
Climatic data:
  Mean annual precipitation: 14 to 18 inches
  Mean annual air temperature: 48 to 51 degrees F
  Frost-free period: 110 to 140 days
Taxonomic class: Fine, mixed, superactive, mesic Aridic Haplustalfs

Typical Pedon

Hosta clay loam in an area of mapping unit Parkelei family-Hosta complex, 3 to 8 percent slopes; McKinley County, New Mexico; Hard Ground Flats Quadrangle; lat. 35 degrees 41 minutes 28 seconds N. and long. 108 degrees 34 minutes 18 seconds W., NAD 27.

A—0 to 8 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, moderately sticky and moderately plastic; many very fine, common fine, and few medium roots; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Bt—8 to 15 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, firm, very sticky and moderately plastic; common fine and few very fine, medium, and coarse roots; common very fine irregular pores; few faint clay films faces of peds and lining pores; slightly effervescent; moderately alkaline (pH 8.3); clear smooth boundary.

Btk1—15 to 22 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; moderate medium angular blocky structure; very hard, very firm, very sticky and very plastic; few very fine and fine roots; common very fine irregular pores; few faint clay films on
faces of peds and lining pores; few medium masses of calcium carbonate in pores and root channels; strongly effervescent; moderately alkaline (pH 8.3); clear wavy boundary.

Btk2—22 to 33 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; moderate medium angular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine irregular pores; few faint clay films on faces of peds and lining pores; common medium and coarse masses of calcium carbonate in pores and root channels; strongly effervescent; moderately alkaline (pH 8.4); gradual wavy boundary.

Btk3—33 to 46 inches; pale brown (10YR 6/3) clay, brown (10YR 4/3) moist; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; many very fine irregular pores; few faint clay films on faces of peds and lining pores; many medium and coarse masses of calcium carbonate in pores and root channels; violently effervescent; slightly alkaline (pH 7.7); gradual wavy boundary.

C—46 to 60 inches; brown (7.5YR 5/2) clay, dark brown (7.5YR 3/2) moist; massive; very hard, very firm, very sticky and very plastic; slightly effervescent; slightly alkaline (pH 7.8).

Range in Characteristics

Particle-size control section: 35 to 50 percent clay
Rock fragments: less than 5 percent in any horizon
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
  Hue: 5YR, 7.5YR, 10YR, 2.5Y
  Value: 4 to 6 dry, 3 to 5 moist
  Chroma: 3 or 4, dry or moist

Bt and Btk horizons:
  Hue: 10YR, 2.5Y
  Value: 4 to 6 dry, 3 to 5 moist
  Chroma: 3 or 4 dry, 2 to 4 moist
  Texture: clay loam, sandy clay loam, loam

C horizon and Bk horizon (when present):
  Hue: 5YR, 7.5YR
  Value: 5 or 6 dry, 3 or 4 moist
  Chroma: 2 to 6, dry or moist
  Texture: clay, sandy clay loam

Huerfano Series

Depth class: shallow
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: erosional remnants on plateaus
Parent material: alluvium over residuum derived from sandstone and shale
Elevation: 5,800 to 6,500 feet
Slope: 1 to 5 percent

Climatic data:
- Mean annual precipitation: 6 to 10 inches
- Mean annual air temperature: 51 to 54 degrees F
- Frost-free period: 130 to 160 days

Taxonomic class: Loamy, mixed, superactive, mesic, shallow Typic Natrargids

Typical Pedon

Huerfano gravelly fine sandy loam in an area of mapping unit Fajada-Huerfano-Benally family complex, 1 to 5 percent slopes; San Juan County, New Mexico; east of Grey Hill Spring Quadrangle; lat. 36 degrees 02 minutes 15 seconds N. and long. 108 degrees 23 minutes 50 seconds W., NAD 27.

A—0 to 2 inches; light yellowish brown (2.5Y 6/4) gravelly fine sandy loam, light olive brown (2.5Y 5/4) moist; weak very fine granular structure; slightly hard, friable, nonsticky and nonplastic; few very fine roots; 20 percent sandstone and siderite gravel; violently effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.

Btn—2 to 6 inches; light yellowish brown (2.5Y 6/4) sandy clay loam, light olive brown (2.5Y 5/4) moist; moderate fine columnar structure; hard, friable, moderately sticky and moderately plastic; few very fine roots; few very fine irregular pores; common distinct clay films on faces of peds and bridging sand grains; violently effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.

Bk—6 to 11 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak very fine and fine subangular blocky structure; hard, friable, slightly sticky and nonplastic; few very fine roots; few very fine calcium carbonate masses; strongly effervescent; strongly alkaline (pH 8.6); abrupt smooth boundary.

Cr—11 inches; soft sandstone bedrock.

Range in Characteristics

Particle-size control section: 13 to 35 percent clay
Depth to a paralithic contact: 10 to 15 inches to shale
Rock fragments: 0 to 20 percent
Calcium carbonate equivalent: 1 to 5 percent
Gypsum content: 0 to 2 percent
Salinity: EC of 0 to 4 dS/m
Sodicity: SAR of 13 to 30

A horizon:
- Hue: 10YR, 2.5Y
- Value: 6 or 7 dry
- Chroma: 3 or 4, dry or moist
- Rock fragments: 10 to 20 percent sandstone and siderite gravel

Bt and Btn horizon:
- Hue: 10YR, 2.5Y
- Value: 4 to 6, dry or moist
- Chroma: 4 or 6, dry or moist
- Texture: clay loam, sandy clay loam

Bk and BC horizons:
- Hue: 10YR, 2.5Y
- Value: 5 or 6 dry
- Texture: fine sandy loam, sandy clay loam
Ives Series

Depth class: very deep
Drainage class: somewhat excessively
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: flood plains and alluvial fans
Parent material: fan and stream alluvium derived from sandstone
Elevation: 5,000 to 6,500 feet
Slope: 0 to 3 percent
Climatic data:
  Mean annual precipitation: 6 to 10 inches
  Mean annual air temperature: 51 to 54 degrees F
  Frost-free period: 130 to 160 days
Taxonomic class: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents

Typical Pedon

Ives very fine sandy loam in an area of mapping unit Wepo-Ives-Jocity association, 0 to 2 percent slopes; Navajo County, New Mexico; Sunflower Butte Quadrangle; lat. 35 degrees 17 minutes 03 seconds N. and long. 110 degrees 09 minutes 27 seconds W., NAD 27.

A—0 to 1 inch; reddish yellow (5YR 6/6) very fine sandy loam, yellowish red (5YR 4/6) moist; single grain; loose, nonsticky and nonplastic; common very fine roots; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C1—1 to 8 inches; light reddish brown (5YR 6/4) very fine sandy loam, reddish brown (5YR 4/4) moist; strong thick platy structure and moderate medium angular blocky; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; very few very fine irregular pores; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C2—8 to 22 inches; light reddish brown (5YR 6/4) fine sandy loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine, few fine, and few medium roots; few very fine irregular pores; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C3—22 to 33 inches; reddish yellow (5YR 6/6) fine sandy loam, reddish brown (5YR 4/4) moist; common very fine roots; very few very fine irregular pores; strongly effervescent; strongly alkaline (pH 8.6); abrupt smooth boundary.

C4—33 to 60 inches; reddish yellow (5YR 6/6) fine sandy loam, reddish brown (5YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; strongly effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.

C5—60 to 70 inches; reddish yellow (5YR 6/6) sandy loam, reddish brown (5YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C6—70 to 80 inches; reddish yellow (5YR 6/6) sandy clay loam, reddish brown (5YR 4/4) moist; hard, friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline (pH 8.2).

Range in Characteristics

Particle-size control section: 5 to 18 percent clay
Rock fragments: 0 to 10 percent gravel
Reaction: moderately or strongly alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: 0 to 2 percent
Salinity: EC of 0 to 4 dS/m
Sodicity: SAR of 0 to 4

A horizon:
   Hue: 5YR, 7.5YR, 10YR
   Value: 4 to 7 dry, 3 to 5 moist
   Chroma: 3 to 6, dry or moist

C horizon:
   Hue: 5YR, 7.5YR, 10YR
   Value: 4 to 7 dry, 3 to 5 moist
   Chroma: 3 to 6, dry or moist
   Texture: fine sandy loam, sandy loam, sandy clay loam, with thin strata of coarser
   or finer textures.

Iwela family

Depth class: very deep
Drainage class: well
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Geomorphic position: stable landslides
Parent material: colluvium derived from sandstone and shale
Elevation: 6,800 to 7,800 feet
Slope: 10 to 40 percent
Climatic data:
   Mean annual precipitation: 14 to 18 inches
   Mean annual air temperature: 48 to 51 degrees F
   Frost-free period: 110 to 140 days
Taxonomic class: Fine-loamy, mixed, superactive, mesic Aridic Haplustalfs

Typical Pedon

Iwela family in an area of mapping unit Iwela family-Nomrah-Vosburg complex, 1 to
40 percent slopes; McKinley County, New Mexico; Chuska Peak Quadrangle; lat. 35
degrees 54 minutes 12 seconds N. and long. 108 degrees 48 minutes 08 seconds
W., NAD 27.

A—0 to 2 inches; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist;
weak very fine granular structure; loose, nonsticky and nonplastic; common very fine
roots; 1 percent gravel; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.

Bw—2 to 7 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish
brown (10YR 4/4) moist; weak medium and coarse subangular blocky structure; soft,
very friable, nonsticky and nonplastic; noneffervescent; neutral (pH 7.0); abrupt
smooth boundary.

Bt1—7 to 13 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak
medium subangular blocky structure; slightly hard, friable, moderately sticky and
moderately plastic; few faint clay films on faces of peds; noneffervescent; neutral (pH
7.2); abrupt smooth boundary.

Bt2—13 to 19 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; strong
very fine and fine subangular blocky structure; very hard, very firm, moderately sticky
and moderately plastic; common distinct clay films on faces of peds; 5 percent gravel;
noneffervescent; neutral (pH 7.2); abrupt smooth boundary.

Bt3—19 to 28 inches; brown (7.5YR 5/3) loam, brown (7.5YR 4/3) moist; weak
medium and coarse subangular blocky structure; very hard, very firm, moderately sticky and moderately plastic; few distinct clay films on faces of peds; non-effervescent; neutral (pH 7.2); abrupt smooth boundary.

Bt4—28 to 45 inches; brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few faint clay films on faces of peds; non-effervescent; neutral (pH 7.2); abrupt smooth boundary.

Bk1—45 to 50 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine masses of calcium carbonate; 5 percent gravel; slightly effervescent; slightly alkaline (pH 7.4); abrupt smooth boundary.

Bk2—50 to 60 inches; pink (7.5YR 7/4) loam, brown (7.5YR 5/4) moist; weak fine and medium subangular blocky structure; common very fine masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.2).

**Range in Characteristics**

- **Particle-size control section:** 26 to 32 percent clay
- **Reaction:** neutral to moderately alkaline
- **Calcium carbonate equivalent:** 0 to 2 percent
- **Gypsum content:** none
- **Salinity:** EC of 0 to 2 dS/m
- **Sodicity:** none

**Bw and Bt horizons:**
- **Hue:** 10YR, 7.5YR
- **Chroma:** 3 or 4, dry or moist
- **Texture:** clay loam, loam, fine sandy loam.

**Bk horizon:**
- **Value:** 4 or 5, dry or moist
- **Texture:** loam, clay loam

**Jeddito Series**

*Depth class:* very deep
*Drainage class:* well
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)
*Geomorphic position:* stream terraces
*Parent material:* fan alluvium derived from sandstone
*Elevation:* 5,500 to 6,000 feet
*Slope:* 0 to 5 percent
*Climatic data:*
  - Mean annual precipitation: 6 to 10 inches
  - Mean annual air temperature: 51 to 54 degrees F
  - Frost-free period: 130 to 160 days
*Taxonomic class:* Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents

**Typical Pedon**

Jeddito loamy fine sand in an area of map unit Jeddito loamy fine sand, 0 to 2 percent slopes; McKinley County, New Mexico; lat. 35 degrees 48 minutes 36 seconds N. and long. 108 degrees 31 minutes 06 seconds W., NAD 27
- **A—0 to 2 inches:** light yellowish brown (10YR 6/4) loamy fine sand, yellowish
brown (10YR 5/4) moist; weak fine subangular blocky structure; hard, friable, nonsticky and nonplastic; few very fine roots; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C1—2 to 18 inches; yellowish brown (10YR 5/4) stratified loamy fine sand, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

C2—18 to 60 inches; light yellowish brown (2.5Y 6/4) stratified fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine and very fine roots; slightly effervescent; slightly alkaline.

Range in Characteristics

Particle-size control section: 4 to 18 percent
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 0 to 5 percent
Gypsum content: 0 to 1 percent
Salinity: EC of 0 to 4 dS/m
Sodicity: SAR of 0 to 13

A horizon:
- Value: 6 or 7 dry, 4 to 6 moist
- Chroma: 3 or 4, dry or moist

C horizons:
- Value: 5 or 6 dry, 4 or 5 moist
- Chroma: 2 to 6, dry or moist
- Texture: stratified, fine sandy loam, sandy loam, loamy fine sand, sandy clay loam, clay loam, loam, loamy sand, silt loam.

Jocity Series

Depth class: very deep
Drainage class: well
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Geomorphic position: flood plains
Parent material: stream alluvium derived from sandstone and shale
Elevation: 4,800 to 6,200 feet
Slope: 0 to 3 percent
Climatic data:
- Mean annual precipitation: 6 to 10 inches
- Mean annual air temperature: 51 to 54 degrees F
- Frost-free period: 130 to 160 days
Taxonomic class: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents

Typical Pedon

Jocity loam in an area of mapping unit Wepo-Ives-Jocity association, 0 to 2 percent slopes; Navajo County, Arizona; Arrowhead Butte, NE Quadrangle; lat. 35 degrees 27 minutes 45 seconds N. and long. 109 degrees 48 minutes 38 seconds W., NAD 27.

A—0 to 8 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/3) moist; weak very thick platy; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, few fine and medium roots; many very fine dendritic tubular pores; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C1—8 to 15 inches; light reddish brown (5YR 6/3) clay loam, reddish brown (5YR
5/3) moist; massive; hard, friable, moderately sticky and moderately plastic; common very fine, few fine and medium roots; many very fine dendritic tubular pores; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C2—15 to 23 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; massive; soft, loose, nonsticky and nonplastic; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; very few medium irregular pores; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C3—23 to 45 inches; light reddish brown (5YR 6/4) clay loam, reddish brown (5YR 5/4) moist; massive; hard, friable, moderately sticky and moderately plastic; few very fine and fine roots; few very fine dendritic tubular pores; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

C4—45 to 65 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; very few very fine roots; very few very fine dendritic tubular pores; strongly effervescent; moderately alkaline (pH 8.2).

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Rock fragments: 0 to 5 percent
Reaction: moderately alkaline
Calcium carbonate equivalent: 0 to 15 percent
Gypsum: 0 to 5 percent
Salinity: EC of 0 to 32 dS/m.
Sodicity: SAR of 0 to 13
Other: saline-sodic phase has EC and SAR ranges higher than typical.

A horizon:
  Hue: 5YR, 7.5YR, 10YR
  Value: 4 to 7 dry, 3 to 5 moist
  Chroma: 1 to 5, dry or moist

C horizon:
  Hue: 5YR, 7.5YR, 10YR
  Value: 4 to 7 dry, 3 to 5 moist
  Chroma: 1 to 6, dry or moist
  Texture: sandy clay loam, clay loam, clay, silty clay loam, strata of loamy sand to silt loam is present in some horizons

Some pedons contain sand or clay horizons at depths of 40 to 60 inches.

Jocity family

Depth class: very deep
Drainage class: well
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Geomorphic position: flood plains on valley floors
Parent material: stream alluvium derived from sandstone and shale
Elevation: 5,800 to 6,500 feet
Slope: 0 to 2 percent
Climatic data:
  Mean annual precipitation: 6 to 10 inches
  Mean annual air temperature: 51 to 54 degrees F
  Frost-free period: 130 to 160 days
Taxonomic class: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents
Typical Pedon

Jocity family in an area of mapping unit Notal-Jocity family complex, 0 to 2 percent slopes; McKinley County, New Mexico; Coyote Canyon NW Quadrangle; lat. 35 degrees 59 minutes 53 seconds N. and long. 108 degrees 38 minutes 29 seconds W., NAD 27.

A—0 to 4 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; soft, friable, slightly sticky and slightly plastic; few very fine roots; 1 percent cobbles, 1 percent gravel; slightly effervescent; moderately alkaline (8.0); abrupt smooth boundary.

Bw—4 to 9 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; moderate very fine subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine roots; few thin plates of silt; violently effervescent; moderately alkaline (8.0); abrupt smooth boundary.

C1—9 to 15 inches; light yellowish brown (2.5Y 6/4) sandy clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine roots; violently effervescent; moderately alkaline (8.0); abrupt smooth boundary.

C2—15 to 20 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; violently effervescent; moderately alkaline (8.0); abrupt smooth boundary.

C3—20 to 27 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; violently effervescent; moderately alkaline (8.0); abrupt smooth boundary.

C4—27 to 48 inches; light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; violently effervescent; moderately alkaline (8.0); abrupt smooth boundary.

C5—48 to 60 inches; light olive brown (2.5Y 5/4) silt loam, olive brown (2.5Y 4/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; slightly effervescent; moderately alkaline (8.0).

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Calcium carbonate equivalent: 0 to 5 percent
Gypsum: 0 to 2 percent
Salinity: EC of 0 to 4 dS/m
Sodicity: none to 20

A horizon:
  Hue: 10YR, 2.5Y
  Value: 5 or 6 dry
  Chroma: 3 or 4, dry or moist

Bw horizon:
  Hue: 10YR, 2.5Y

C horizons:
  Hue: 10YR, 2.5Y
  Value: 5 or 6 dry, 4 or 5 moist
  Chroma: 3 or 4, dry or moist
  Texture: loamy fine sand, loamy sand, very fine sandy loam, fine sandy loam, sandy clay loam, loam, silt loam, clay loam, clay
  Other features: thin strata, including sandy loam and silt loam, are present.
**Joraibi Series**

*Depth class:* very deep  
*Drainage class:* well  
*Slowest permeability:* 0.06 to 0.2 in/hr (slow)  
*Geomorphic position:* flood plains  
*Parent material:* stream alluvium derived from sandstone and shale  
*Elevation:* 5,100 to 5,600 feet  
*Slope:* 0 to 2 percent  
*Climatic data:*  
  - Mean annual precipitation: 6 to 10 inches  
  - Mean annual air temperature: 51 to 54 degrees F  
  - Frost-free period: 130 to 160 days  
*Taxonomic class:* Fine-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, mesic Typic Torrifluvents  

**Typical Pedon**

Joraibi clay loam in an area of mapping unit Joraibi clay loam, 0 to 2 percent slopes; Navajo County, Arizona; southwest of Garces Mesa in the Soil Survey of Hopi Area, Arizona; 0.2 mile from the southwest corner of sec. 17, T. 25 N., R. 13 E.

A—0 to 2 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 5/4) moist; moderate thin platy structure over weak fine granular; hard, firm, moderately sticky and moderately plastic; few very fine roots; common fine irregular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C1—2 to 5 inches; reddish brown (5YR 5/4) fine sandy loam, yellowish red (5YR 4/6) moist; weak medium platy structure; hard, firm, moderately sticky and moderately plastic; few very fine roots; few fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

C2—5 to 11 inches; yellowish brown (5YR 4/6) sandy clay loam, reddish brown (5YR 5/4) moist; massive with thinly bedded lamina; hard, firm, very sticky and moderately plastic; common very fine roots; few fine tubular pores; slightly effervescent; strongly alkaline; clear smooth boundary.

C3—11 to 19 inches; light reddish brown (5YR 6/3) clay loam, reddish brown (5YR 5/4) moist; massive with thinly bedded lamina; very hard, firm, very sticky and moderately plastic; few fine roots; common fine tubular pores; slightly effervescent; strongly alkaline; abrupt smooth boundary.

C4—19 to 23 inches; reddish brown (5YR 5/4) very fine sandy loam, yellowish red (5YR 4/6) moist; massive with thinly bedded lamina; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine tubular pores; slightly effervescent; strongly alkaline; abrupt smooth boundary.

2C5—23 to 26 inches; yellowish red (5YR 5/8) sand, yellowish red (5YR 5/8) moist; massive; hard, very friable, nonsticky and nonplastic; few very fine roots; few fine tubular pores; slightly effervescent; strongly alkaline; abrupt smooth boundary.

2C6—26 to 54 inches; reddish yellow (5YR 6/6) sand that has thin strata of coarse sand, fine sand, and very fine sandy loam, reddish brown (5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few fine tubular pores; slightly effervescent; strongly alkaline; abrupt smooth boundary.

3C7—54 to 60 inches; light reddish brown (5YR 6/4) stratified very fine sandy loam to clay loam, reddish brown (5YR 5/4) moist; weak medium prismatic structure parting to weak medium subangular blocky; very hard, firm, moderately sticky and very plastic; no roots; few fine tubular pores; slightly effervescent; moderately alkaline.
Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Reaction: moderately or strongly alkaline
Calcium carbonate equivalent: 0 to 10 percent
Gypsum: none
Salinity: EC of 2 to 16 dS/m
Sodicity: SAR of 20 to 45

A horizon:
  Hue: 5YR, 7.5YR.
  Value: 5 or 6 dry, 4 or 5 moist
  Chroma: 3 or 4, dry or moist
  Texture: Fine sandy loam, sandy clay loam, clay loam.

C horizon:
  Hue: 5YR, 7.5YR.
  Value: 4 to 6 dry, 3 to 5 moist
  Chroma: 3 to 8, dry or moist

Kimnoli Series

Depth class: shallow
Drainage class: well
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: summits of mesas and hills
Parent material: eolian material and slope alluvium derived from sandstone and shale
Elevation: 6,000 to 6,800 feet
Slope: 1 to 8 percent
Climatic data:
  Mean annual precipitation: 6 to 10 inches
  Mean annual air temperature: 51 to 54 degrees F
  Frost-free period: 130 to 160 days
Taxonomic class: Loamy, mixed, superactive, mesic Lithic Haplargids

Typical Pedon

Kimnoli loamy fine sand in an area of mapping unit Norkiki family-Kimnoli complex, 1 to 8 percent slopes; San Juan County, New Mexico; east of Grey Hill Springs Quadrangle; lat. 36 degrees 02 minutes 48 seconds N. and long. 108 degrees 23 minutes 58 seconds W., NAD 27.

A—0 to 2 inches; light yellowish brown (2.5Y 6/4) loamy fine sand, light olive brown (2.5Y 5/4) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; 5 percent gravel; very slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bt—2 to 7 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; loose, very friable, nonsticky and nonplastic; many very fine roots; few distinct clay films on faces of peds; 2 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Btk1—7 to 12 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few distinct
clay films on faces of peds and bridging sand grains; few very fine masses of calcium carbonate; 2 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Btk2—12 to 19 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few distinct clay films on faces of peds; 10 percent gravel; few very fine masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

R—19 inches; sandstone bedrock.

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Depth to lithic contact: 10 to 20 inches
Rock fragments: 0 to 10 percent gravel and cobble
Calcium carbonate equivalent: 0 to 5 percent
Depth to secondary carbonates: 7 to 18 inches
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 1

Bt and Btk horizons:
  Value: 6 or 7 dry
  Chroma: 3 or 4, dry or moist
  Texture: sandy clay loam, fine sandy loam, sandy loam, loamy sand.

Kinusta family

Depth class: very shallow and shallow
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: structural benches on escarpments
Parent material: colluvium and residuum derived from siltstone, limestone, and sandstone
Elevation: 5,200 to 7,000 feet
Slope: 8 to 65 percent
Climatic data:
  Mean annual precipitation: 10 to 14 inches
  Mean annual air temperature: 50 to 53 degrees F
  Frost-free period: 120 to 150 days
Taxonomic class: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents

Typical Pedon

Kinusta family in an area of mapping unit Kinusta-Reef-Tekapo families complex, 1 to 60 percent slopes; Apache County, Arizona; Indian Wells Quadrangle; lat. 35 degrees 23 minutes 47 seconds N. and long. 110 degrees 03 minutes 28 seconds W., NAD 27.

A—0 to 3 inches; light brown (7.5YR 6/4) gravelly sandy loam, brown (7.5YR 4/3) moist; single grain; loose, nonsticky and nonplastic; many very fine roots; 30 percent gravel; slightly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bw—3 to 8 inches; brown (7.5YR 5/4) gravelly sandy loam, brown (7.5YR 4/3)
moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; 30 percent gravel; slightly effervescent; strongly alkaline (pH 8.8); clear smooth boundary.

Ck—9 to 19 inches; yellowish red (5YR 5/6) fine sandy loam, reddish brown (2.5YR 4/4) moist; massive; extremely hard, very friable, slightly sticky and nonplastic; few masses of calcium carbonate; 2 percent gravel; slightly effervescent; very strongly alkaline (pH 9.2); clear smooth boundary.

Cr—19 inches; soft red sandstone.

Range in Characteristics

Particle-size control section: 10 to 25 percent clay
Depth to lithic contact: 5 to 20 inches
Calcium carbonate equivalent: 0 to 10 percent
Gypsum: 0 to 1 percent
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2

A horizon:
  Hue: 2.5YR, 5YR to 7.5YR
  Value: 5 or 6 dry, 4 or 5 moist
  Chroma: 2 to 6, dry or moist
  Reaction: slightly or moderately alkaline
  Rock fragments: 0 to 20 percent
  Texture: sandy loam, clay loam, sandy clay loam

C horizons:
  Hue: 2.5YR, 5YR to 7.5YR
  Value: 5 or 6 dry, 4 or 5 moist
  Chroma: 3 to 6, dry or moist
  Reaction: moderately or strongly alkaline
  Rock fragments: 0 to 85 percent
  Texture: clay loam, sandy clay loam, loam, sandy loam

Klizhin family

Depth class: very deep
Drainage class: well
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: summits of plateaus
Parent material: slope alluvium and residuum derived from sandstone
Elevation: 7,400 to 8,400 feet
Slope: 1 to 60 percent
Climatic data:
  Mean annual precipitation: 18 to 22 inches
  Mean annual air temperature: 40 to 43 degrees F
  Frost-free period: 80 to 110 days
Taxonomic class: Coarse-loamy, mixed, superactive, frigid Pachic Haplustolls

Typical Pedon

Klizhin family in an area of mapping unit Klizhin-Sandark families complex, 20 to 65 percent slopes; McKinley County, New Mexico; Chuska Peak Quadrangle; lat. 35 degrees 59 minutes 11 seconds N. and long. 108 degrees 51 minutes 50 seconds W., NAD 27.

Oe—0 to 1 inch; decomposing pine needles.
A1—1 to 4 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3)
moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; slightly acid (pH 6.3); abrupt smooth boundary.

A2—4 to 11 inches; very dark gray (10YR 3/1) fine sandy loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; moderately acid (pH 5.7); clear wavy boundary.

A3—11 to 18 inches; brown (10YR 4/3) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; moderately acid (pH 5.8); clear wavy boundary.

Bw1—18 to 25 inches; brown (10YR 4/3) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; moderately acid (pH 5.6); clear wavy boundary.

Bw2—25 to 35 inches; very dark grayish brown (10YR 3/2) fine sandy loam, black (10YR 2/1) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; moderately acid (pH 5.6); clear wavy boundary.

Bw3—35 to 47 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; strongly acid (pH 5.4); clear wavy boundary.

BC—47 to 55 inches: brown (10YR 5/3) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; strongly acid (pH 5.4); clear wavy boundary.

C1—55 to 60 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few fine roots; strongly acid (pH 5.4); abrupt wavy boundary.

C2—60 to 70 inches; brownish yellow (10YR 6/6) sand, yellowish brown (10YR 5/6) moist; single grain; soft, very friable, nonsticky and nonplastic; common very fine and few fine roots; strongly acid (pH 5.4).

**Range in Characteristics**

- **Particle-size control section:** 7 to 18 percent clay
- **Rock fragments:** 0 to 10 percent small channers or gravel
- **Reaction:** strongly acid to neutral
- **Calcium carbonate equivalent:** none
- **Gypsum:** none
- **Salinity:** EC of 0 to 2 dS/m
- **Sodicity:** none

**A horizon:**
- **Value:** 3 to 5 dry, 2 or 3 moist
- **Chroma:** 1 to 3, dry or moist
- **Texture:** fine sandy loam, loamy fine sand, sandy loam, loamy fine sand, loam

**Bw horizons:**
- **Hue:** 7.5YR, 10YR
- **Value:** 4 or 5 dry, 3 or 4 moist
- **Chroma:** 1 to 3, dry or moist
- **Texture:** fine sandy loam, sandy loam, loam

**C horizon:**
- **Value:** 5 to 7 dry, 3 to 5 moist

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Fort Defiance Area, Arizona and New Mexico
Chroma: 2 to 4, dry or moist  
Texture: loamy fine sand, very fine sandy loam, fine sandy loam.

**Kunz Series**

*Depth class:* very deep  
*Drainage class:* well  
*Slowest permeability:* 0.2 to 0.6 in/hr (moderately slow)  
*Geomorphic position:* summits of plateaus  
*Parent material:* slope alluvium derived from sandstone and shale  
*Elevation:* 7,500 to 8,000 feet  
*Slope:* 10 to 35 percent  
*Climatic data:*  
  - Mean annual precipitation: 18 to 22 inches  
  - Mean annual air temperature: 40 to 43 degrees F  
  - Frost-free period: 80 to 110 days  
*Taxonomic class:* Fine-loamy, mixed, superactive, frigid Typic Haplustalfs

**Typical Pedon**

Kunz loam in an area of mapping unit Kunz-Yahmore family complex, 2 to 35 percent slopes; McKinley County, New Mexico; Chuska Peak Quadrangle; lat. 35 degrees 54 minutes 27 seconds N. and long. 108 degrees 49 minutes 01 seconds W., NAD 27.

A—0 to 1 inch; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; single grain; loose, very friable, slightly sticky and slightly plastic; common very fine and fine roots; 1 percent gravel; noneffervescent; neutral (pH 6.8); abrupt smooth boundary.

Bt1—1 to 13 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common distinct clay films on faces of peds; noneffervescent; slightly alkaline (pH 7.4); clear smooth boundary.

Bt2—13 to 23 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common distinct clay films on faces of peds; noneffervescent; slightly alkaline (pH 7.4); clear smooth boundary.

Bt3—23 to 50 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few coarse roots; common distinct clay films on faces of peds; noneffervescent; slightly alkaline (pH 7.4); clear smooth boundary.

Btk—50 to 60 inches; strong brown (7.5YR 5/6) clay loam, strong brown (7.5YR 4/6) moist; weak very fine and fine subangular blocky structure; hard, firm, moderately sticky and moderately plastic; common distinct clay films on faces of peds; common fine and medium masses of calcium carbonate; very slightly effervescent; slightly alkaline (pH 7.8).

**Range in Characteristics**

Particle-size control section: 20 to 35 percent clay  
Reaction: neutral or slightly alkaline  
Calcium carbonate equivalent: none  
Gypsum: none  
Salinity: EC of 0 to 2 dS/m  
Sodicity: none
A horizon:
   Hue: 10YR, 7.5YR
   Value: 3 to 5 dry, 2 to 4 moist
   Chroma: 1 to 4, dry or moist
   Texture: loam, fine sandy loam, sandy loam

Bt horizon
   Hue: 10YR, 7.5YR
   Value: 2 to 6 dry, 3 to 5 moist
   Chroma: 2 to 6, dry or moist

BC and Btk horizons (when present):
   Hue: 10YR, 7.5YR
   Value: 5 or 6 dry, 4 or 5 moist
   Chroma: 2 to 6, dry or moist

Kydestea Series

Depth class: very shallow and shallow
Drainage class: well
Slowest permeability: 0.2 to 0.6 (moderately slow)
Geomorphic position: hills
Parent material: alluvium and colluvium from sedimentary rocks
Elevation: 5,900 to 6,800 feet
Slope: 5 to 50 percent
Climatic data:
   Mean annual precipitation: 10 to 14 inches
   Mean annual air temperature: 50 to 52
   Frost-free period: 130 to 160 days
Taxonomic class: Loamy-skeletal, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthents

Typical Pedon

Kydestea very channery sandy clay loam in an area of mapping unit Kydestea-Zyme-Tonalea complex, 5 to 50 percent slopes; about 2,990 feet west and 2,250 feet north of the intersection of metric coordinates 4016 N. and 521 E. in the Soil Survey of Hopi Area, Arizona; about 8.0 miles west of Cottonwood Spring and 0.3 miles north of the Black Mesa pipeline:
   A—0 to 1 inches; light yellowish brown (10YR 6/4) very channery sandy clay loam, brown (10YR 4/3) moist; weak thick platy structure; slightly hard, friable, moderately sticky and slightly plastic; few very fine roots; many very fine vesicular pores; about 55 percent sandstone channers; strongly effervescent; mildly alkaline; clear smooth boundary.
   C1—1 to 5 inches; brown (10YR 5/3) very channery sandy clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; about 45 percent sandstone channers and 10 percent flagstones; strongly effervescent; moderately alkaline; clear smooth boundary.
   C2—5 to 10 inches; brown (10YR 5/3) extremely channery sandy clay loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; few very fine tubular pores; about 60 percent sandstone channers and 5 percent flagstones; strongly effervescent; moderately alkaline; abrupt smooth boundary.
C3—10 to 15 inches; pale brown (10YR 6/3) extremely channery sandy clay loam, dark yellowish brown (10YR 4/4) moist; massive slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; about 60 percent sandstone channers and 5 percent flagstones; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2R—15 inches; sandstone.

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Rock fragments: more than 35 percent channers; flagstones average less than 15 percent
Depth to bedrock: 4 to 19 inches
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 5 to 15 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
- Hue: 10YR, 7.5YR
- Value: 4 to 7 dry, 3 to 5 moist
- Chroma: 3 to 6, dry or moist

C horizons:
- Hue: 10YR or 7.5YR
- Value: 5 or 6 dry, 4 or 5 moist
- Chroma: 3 to 6 dry, 2 to 4 moist
- Texture: sandy clay loam, sandy loam, clay loam

Manuelito Series

Depth class: moderately deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: summits of plateaus
Parent material: eolian material and slope alluvium derived from sandstone and shale
Elevation: 7,500 to 8,000 feet
Slope: 1 to 15 percent
Climatic data:
- Mean annual precipitation: 18 to 22 inches
- Mean annual air temperature: 46 to 48 degrees F
- Frost-free period: 110 to 130 days
Taxonomic class: Fine-loamy, mixed, superactive, mesic Typic Haplustalfs

Typical Pedon

Manuelito very fine sandy loam in an area of mapping unit Verite-Manuelito complex, 2 to 8 percent slopes; McKinley County, New Mexico; Chuska Peak Quadrangle; 5,940 feet west and 1,980 feet north of Asaayi Lake; lat. 35 degrees 59 minutes 01 seconds N. and long. 108 degrees 54 minutes 40 seconds W., NAD 27.

A—0 to 6 inches; dark grayish brown (10YR 4/2) very fine sandy loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine roots; common fine irregular pores; neutral (pH 6.6); clear smooth boundary.

AB—6 to 12 inches; brown (7.5YR 5/2) very fine sandy loam, brown (7.5YR 4/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and
slightly plastic; common fine roots; common fine vesicular pores; neutral (pH 6.9); gradual smooth boundary.

Bt—12 to 23 inches; yellowish red (5YR 4/6) sandy clay loam, reddish brown (5YR 4/4) moist; moderate fine angular blocky structure; hard, firm, moderately sticky and moderately plastic; common very fine roots; common fine tubular pores; common faint clay films on faces of peds; neutral (pH 7.2); gradual smooth boundary.

Btk—23 to 30 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak fine subangular blocky structure; hard, friable, moderately sticky and moderately plastic; common fine roots; common fine tubular pores; common faint clay films on faces of peds; slightly effervescent, secondary calcium carbonates segregated as common fine accumulations on undersides of rock fragments; slightly alkaline (pH 7.5); abrupt smooth boundary.

Bk—30 to 35 inches; strong brown (7.5YR 4/6) fine sandy loam, dark brown (7.5YR 3/4) moist; weak medium subangular blocky structure; very hard, firm, slightly sticky and nonplastic; few fine roots; strongly effervescent, secondary calcium carbonates segregated as few fine accumulations in root channels and pores and on undersides of rock fragments; moderately alkaline (pH 7.9); abrupt smooth boundary.

2R—35 inches; hard sandstone bedrock.

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Depth to lithic contact: 20 to 40 inches to sandstone
Rock fragments: 0 to 15 percent gravel
Reaction: neutral in upper part and slightly or moderately alkaline in lower part
Calcium carbonate equivalent: 0 to 15 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
Hue: 7.5YR, 5YR, 10YR
Value: 3 to 5 dry, 2 to 4 moist
Chroma: 2 or 3 dry or moist
Texture: very fine sandy loam or fine sandy loam

AB horizon:
Hue: 7.5YR, 10YR
Value: 3 to 5 dry, 2 to 4 moist
Chroma: 2 or 3 dry or moist
Texture: very fine sandy loam or fine sandy loam

Bt horizon:
Hue: 5YR, 7.5YR
Value: 4 to 6 dry, 3 or 4 moist
Chroma: 4 or 6 dry or moist
Texture: very fine sandy loam or fine sandy loam

Btk horizon:
Hue: 5YR, 7.5YR
Value: 4 to 6 dry, 3 or 4 moist
Chroma: 4 or 6 dry or moist
Texture: sandy clay loam or very fine sandy loam

Bk horizon:
Hue: 7.5YR, 10YR
Value: 4 to 6 dry, 3 or 4 moist
Chroma: 4 or 6 dry or moist
Texture: very fine sandy loam or fine sandy loam

Marcou family

Depth class: very deep
Drainage class: well, moderately well
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: dunes on fan terraces
Parent material: eolian material and fan alluvium derived from sandstone
Elevation: 4,800 to 6,200 feet
Slope: 1 to 8 percent
Climatic data:
  - Mean annual precipitation: 6 to 10 inches
  - Mean annual air temperature: 53 to 56 degrees F
  - Frost-free period: 130 to 180 days
Taxonomic class: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents

Typical Pedon

Marcou family in an area of mapping unit Marcou family-Burnswick complex, 1 to 3 percent slopes; Navajo County, Arizona; Sunflower Butte Quadrangle; lat. 35 degrees 15 minutes 02 seconds N. and long. 110 degrees 11 minutes 30 seconds W., NAD 27.

A—0 to 2 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C1—2 to 5 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; very few very fine irregular pores; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C2—5 to 18 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and few fine roots; very few very fine irregular pores; strongly effervescent; very strongly alkaline (pH 9.2); abrupt smooth boundary.

C3—18 to 22 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; strongly effervescent; very strongly alkaline (pH 9.2); abrupt smooth boundary.

C4—22 to 48 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) moist; massive; slightly hard, very friable, nonsticky and nonplastic; strongly effervescent; very strongly alkaline (pH 9.2); abrupt smooth boundary.

C5—48 to 65 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; massive; moderately hard, very friable, slightly sticky and slightly plastic; strongly effervescent; very strongly alkaline (pH 9.2); abrupt smooth boundary.

C6—65 to 80 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) moist; massive; slightly hard, very friable, nonsticky and nonplastic; strongly effervescent; very strongly alkaline (pH 9.2).

Range in Characteristics

Particle-size control section: 8 to 18 percent clay
Rock fragments: 0 to 35 percent
Reaction: moderately or very strongly alkaline
Calcium carbonate equivalent: 0 to 5 percent
Gypsum content: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 5

A horizon:
- Hue: 5YR, 7.5YR, 10YR
- Value: 5 or 6 dry, 4 or 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: fine sandy loam, loam, loamy fine sand or loamy sand

C horizon:
- Hue: 5YR, 7.5YR
- Value: 5 or 6 dry, 4 or 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: sandy loam, coarse sandy loam, sandy clay loam, fine sandy loam, sand, loamy fine sand, loamy sand, clay loam, loam

Mathis family

Depth class: very deep
Drainage class: somewhat excessively
Slowest permeability: 6.0 to 20 in/hr (rapid)
Geomorphic position: side slopes of hills
Parent material: colluvium derived from sandstone
Elevation: 6,000 to 6,800 feet
Slope: 8 to 60 percent
Climatic data:
- Mean annual precipitation: 10 to 14 inches
- Mean annual air temperature: 50 to 53 degrees F
- Frost-free period: 120 to 150 days
Taxonomic class: Sandy-skeletal, mixed, mesic Ustic Torriorthents

Typical Pedon

Mathis family in an area of mapping unit Begay-Milok family-Mathis family complex, 1 to 60 percent slopes; Navajo County, Arizona; Indian Wells Quadrangle; lat. 35 degrees 24 minutes 18 seconds N. and long. 110 degrees 05 minutes 19 seconds W., NAD 27.

A—0 to 4 inches; light brown (7.5YR 6/3) very gravely loamy sand, brown (7.5YR 4/3) moist; weak fine granular structure; soft, loose, nonsticky and nonplastic; many very fine roots; 50 percent gravel; calcium carbonate on bottom of coarse fragments; strongly effervescent; moderately alkaline (pH 8.0); clear smooth boundary

C1—4 to 16 inches; light brown (7.5YR 6/3), very gravely sand, brown (7.5YR 4/3) moist; single grain; loose, nonsticky and nonplastic; common very fine roots; 50 percent gravel; calcium carbonate on the bottom of coarse fragments; strongly effervescent; strongly alkaline (pH 8.8); clear smooth boundary.

C2—16 to 30 inches; light brown (7.5YR 6/3), very gravelly sand, brown (7.5YR 4/3) moist; single grain; loose, nonsticky and nonplastic; common very fine roots; 45 percent gravel and 5 percent cobbles; calcium carbonate on the bottom and sides of coarse fragments; strongly effervescent; strongly alkaline (pH 8.8); clear smooth boundary.

C3—30 to 40 inches; light brown (7.5YR 6/3), very gravely loamy sand, brown (7.5YR 4/3) moist; single grain; loose, nonsticky and nonplastic; 50 percent gravel
and 10 percent cobbles; calcium carbonate on the bottom and sides of coarse fragments; strongly effervescent; very strongly alkaline (pH 9.0); clear smooth boundary.

C4—40 to 65 inches; pink (7.5YR 7/3), very gravely sand, brown (7.5YR 5/3) moist; single grain; loose, nonsticky and nonplastic; 40 percent gravel and 20 percent cobbles; calcium carbonate on the bottom and sides of coarse fragments; strongly effervescent.

Range in Characteristics

Particle-size control section:
Rock fragments: 35 to 65 percent
Reaction: moderately to strongly alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
Hue: 7.5YR, 10YR

C horizons:
Hue: 7.5YR, 10YR
Value: 6 or 7 dry, 4 or 5 moist
Chroma: 2 to 4, dry or moist
Texture: loamy fine sand, sandy loam, loamy sand, fine sand

Mentmore family

Depth class: very deep
Drainage class: well
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Geomorphic position: fan terraces
Parent material: fan alluvium derived from sandstone and shale
Elevation: 6,100 to 7,200 feet
Slope: 1 to 8 percent
Climatic data:
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days
Taxonomic class: Fine-loamy, mixed, superactive, mesic Ustic Haplargids

Typical Pedon

Mentmore family in an area of mapping unit Mentmore family, 1 to 8 percent slopes; Apache, Arizona; Hunter’s Point Quadrangle; lat. 35 degrees 37 minutes 13 seconds N. and long. 109 degrees 03 minutes 56 seconds W., NAD 27.

A—0 to 2 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; 8 percent gravel; non-effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Bt—2 to 10 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; moderate medium and coarse subangular blocky structure; slightly hard, firm, moderately sticky and moderately plastic; common very fine and fine roots; few very fine irregular pores; common distinct clay films on faces of peds; noneffervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bk1—10 to 28 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4)
moist; weak coarse subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine roots; common very fine irregular pores; 2 percent gravel; few very fine masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bk2—28 to 38 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; moderate medium subangular blocky structure; hard, very firm, moderately sticky and moderately plastic; few very fine roots; slightly effervescent; common very fine masses of calcium carbonate; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Bk3—38 to 52 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; weak medium and coarse subangular blocky structure; hard, very firm, moderately sticky and moderately plastic; few very fine roots; slightly effervescent; few very fine masses of calcium carbonate; slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C—52 to 60 inches; light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; weak medium and coarse subangular blocky structure; very hard, very firm, slightly sticky and nonplastic; few very fine roots; 2 percent gravel; slightly effervescent; moderately alkaline (pH 8.0).

Range in Characteristics

Particle-size control section: 20 to 35 percent clay.
Rock fragments: 0 to 5 percent gravel and 0 to 1 cobbles
Reaction: slightly or moderately alkaline.
Calcium carbonate equivalent: 0 to 10 percent
Gypsum: 0 to 2 percent in the lower subsoil
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2

A horizon:
- Hue: 10YR, 2.5Y
- Value: 5 to 7 dry, 3 to 5 moist
- Chroma: 2 to 4 dry or moist
- Texture: fine sandy loam, loam, silt loam

Bt and Btk horizons:
- Value: 4 or 5 dry, 3 to 5 moist
- Chroma: 2 to 4, dry or moist
- Texture: loam, sandy clay loam, clay loam

Bk horizon:
- Value: 5 or 6 dry, 3 to 5 moist
- Chroma: 2 to 4 dry or moist
- Texture: clay loam or loam

Some pedons have By horizons.
The C horizon is missing in some pedons.

Mesa family

Depth class: very deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: fan terraces and summits of mesas
Parent material: fan and slope alluvium derived from sandstone and shale
Elevation: 5,800 to 6,400 feet
Slope: 1 to 4 percent
Climatic data:
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Taxonomic class: Fine-loamy, mixed, superactive, mesic Typic Calciargids

Typical Pedon

Mesa family in an area of mapping unit Mesa family, 1 to 4 percent slopes; San Juan County, New Mexico; Sheep Springs Quadrangle; lat. 36 degrees 7 minutes 37 seconds N. and long. 108 degrees 41 minutes 15 seconds W., NAD 27.

A—0 to 5 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak thick platy structure parting to weak fine subangular blocky; soft, very friable, nonsticky and nonplastic; many fine and medium roots; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bt—5 to 11 inches; brown (7.5YR 5/4) gravelly sandy clay loam, brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few faint clay films on faces of peds and bridging sand grains; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk1—11 to 22 inches; pink (7.5YR 8/3) very cobbly sandy loam, pink (7.5YR 7/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—22 to 40 inches; very pale brown (10YR 8/2) very cobbly fine sandy loam, light gray (10YR 7/2) moist; massive; hard, firm, nonsticky and nonplastic; common very fine and fine roots; violently effervescent; moderately alkaline; clear smooth boundary.

C—40 to 60 inches; very pale brown (10YR 7/3) loamy fine sand, brown (10YR 5/3) moist; massive; loose, nonsticky and nonplastic; few very fine roots; slightly effervescent; moderately alkaline.

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Rock fragments: 0 to 80 percent
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 0 to 5 in the upper part, 15 to 40 percent in the lower part
Gypsum: 0 to 2 percent
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
Hue: 7.5YR, 10YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 1 to 4, dry or moist

Bt horizon:
Hue: 7.5YR, 10YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 2 to 6, dry or moist
Texture: sandy clay loam, sandy loam, fine sandy loam

Bk or C horizons:
Hue: 7.5YR, 10YR
Value: 5 to 8 dry, 4 to 8, moist
Chroma: 2 to 4, dry or moist
Texture: sandy clay loam, fine sandy loam, sandy loam, loamy sand
Millpaw family

Depth class: very deep  
Drainage class: well  
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)  
Geomorphic position: fan terraces  
Parent material: fan alluvium derived from sandstone and shale  
Elevation: 7,600 to 8,000 feet  
Slope: 1 to 3 percent  
Climatic data:
- Mean annual precipitation: 18 to 22 inches  
- Mean annual air temperature: 46 to 48 degrees F  
- Frost-free period: 110 to 130 days  
Taxonomic class: Fine, mixed, superactive, mesic Pachic Argiustolls

Typical Pedon

Millpaw family in an area of mapping unit Umbarg-Millpaw families complex, 1 to 3 percent slopes; San Juan County, New Mexico; Crystal Quadrangle; lat. 36 degrees 00 minutes 19 seconds N. and long. 108 degrees 57 minutes 04 seconds W., NAD 27.

A—0 to 3 inches; brown (10YR 4/3) silt loam, dark brown (10YR 3/3) moist; weak very fine granular; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; very slightly effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Bt1—3 to 6 inches; very dark grayish brown (10YR 3/2) clay loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine and fine roots; few distinct clay films on faces of peds; slightly effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Bt2—6 to 16 inches; brown (10YR 4/3) clay loam, very dark brown (10YR 2/2) moist; strong very fine, fine and medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; common very fine and fine roots; many distinct clay films on faces of peds; very slightly effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Btk—16 to 29 inches; very dark grayish brown (10YR 3/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine, fine, and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; common distinct clay films on faces of peds; very slightly effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Bk1—29 to 47 inches; dark grayish brown (10YR 4/2) fine sandy loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; few fine masses of calcium carbonate; 2 percent gravel; very slightly effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Bk2—47 to 70 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; few fine masses of calcium carbonate; 2 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bk3—70 to 80 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many fine masses of calcium carbonate; 2 percent gravel; violently effervescent; moderately alkaline (pH 8.0).
Range in Characteristics

Particle-size control section: 35 to 50 percent clay
Rock fragments: 0 to 5 percent
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: none
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
  Hue: 10YR, 7.5YR
  Value: 4 or 5 dry, 2 to 4 moist
  Chroma: 2 or 3, dry or moist
  Texture: loam, silt loam

Bt horizon:
  Hue: 10YR, 7.5YR
  Value: 3 to 6 dry, 2 to 4 moist
  Chroma: 2 to 4, dry or moist
  Texture: clay, clay loam, sandy clay

Milok family

Depth class: very deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: fan terraces, hills, and plateaus
Parent material: eolian material and slope alluvium derived from sandstone
Elevation: 5,600 to 6,800 feet
Slope: 1 to 12 percent
Climatic data:
  Mean annual precipitation: 10 to 14 inches
  Mean annual air temperature: 50 to 53 degrees F
  Frost-free period: 120 to 150 days
Taxonomic class: Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids

Typical Pedon

Milok family in an area of mapping unit Milok-Pinavetes families complex, 1 to 12 percent slopes; Navajo County, Arizona; Tsin Naan Tee Quadrangle; lat. 35 degrees 38 minutes 25 seconds N. and long. 110 degrees 06 minutes 43 seconds W., NAD 27.

A—0 to 1 inch; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; common very fine roots; about 3 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bw—1 to 12 inches; yellowish brown (10YR 5/4) very fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; about 1 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.
Bk1—12 to 39 inches; yellowish brown (10YR 5/4) very fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; about 2 percent gravel; few very fine masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk2—39 to 49 inches; light yellowish brown (10YR 6/4) very fine sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; about 3 percent gravel; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk3—49 to 60 inches; light yellowish brown (10YR 6/4) very fine sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; 3 percent gravel; violently effervescent; moderately alkaline (pH 8.2).

Range in Characteristics
Particle-size control section: 8 to 18 percent clay
Rock fragments: 0 to 20 percent
Reaction: moderately or strongly alkaline
Calcium carbonate equivalent: 10 to 35 percent
Depth to calcic horizon: 8 to 18 inches
Gypsum: 0 to 1 percent
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 5

A horizon:
   Hue: 7.5YR, 10YR
   Value: 4 to 6 dry, 3 to 5 moist
   Chroma: 3 to 6, dry or moist

Bw and Bk horizons:
   Hue: 5YR, 7.5YR, 10YR
   Value: 5 or 6 dry, 4 to 6 moist
   Chroma: 3 to 8, dry or moist
   Texture: loamy fine sand, sandy loam, fine sandy loam, very fine sandy loam, loam

Moenkopie Series

Depth class: very shallow to shallow
Drainage class: well
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: summits of mesas and plateaus
Parent material: slope alluvium derived from sandstone and shale
Elevation: 5,300 to 6,400 feet
Slope: 5 to 15 percent
Climatic data:
   Mean annual precipitation: 6 to 10 inches
   Mean annual air temperature: 51 to 54 degrees F
   Frost-free period: 130 to 160 days
Taxonomic class: Loamy, mixed, superactive, calcareous, mesic Lithic Torriorthents

Typical Pedon

Moenkopie loamy fine sand in an area of mapping unit Moenkopie-Monue complex, 3 to 15 percent slopes; Navajo County, Arizona; Indian Wells Quadrangle; lat. 35 degrees 26 minutes 47 seconds N. and long. 110 degrees 03 minutes 40 seconds W., NAD 27.
A—0 to 4 inches; reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/3) moist; weak medium subangular blocky structure parting to weak fine granular; soft, loose, nonsticky and nonplastic; common very fine roots; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C1—4 to 12 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; few very fine dendritic tubular pores; slightly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C2—12 to 13 inches; reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/3) moist; strong very thick platy structure; moderately hard, friable, nonsticky and nonplastic; common very fine roots; slightly effervescent; very strongly alkaline (pH 9.2); abrupt smooth boundary.

R—13 inches; sandstone bedrock.

Range in Characteristics

Particle-size control section: averages 5 to 35 percent clay
Depth to lithic contact: 3 to 20 inches
Rock fragments: 0 to 90 percent
Reaction: moderately or strongly alkaline
Calcium carbonate equivalent: 1 to 5 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 5

A horizon:
  Hue: 5YR, 7.5YR
  Value: 5 to 7 dry, 4 or 5 moist
  Chroma: 2 to 6, dry or moist

B or C horizon:
  Hue: 5YR, 7.5YR
  Value: 5 to 7 dry, 4 to 6 moist
  Chroma: 2 to 6, dry or moist
  Texture: fine sandy loam, sandy loam, clay loam, sandy clay loam, loamy sand, loamy fine sand.

Moncisco Series (taxadjunct)

Depth class: very deep
Drainage class: somewhat excessively
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: side slopes of hills
Parent material: eolian material derived from sandstone over residuum derived from fractured porcelanite
Elevation: 5,800 to 6,500 feet
Slope: 2 to 45 percent
Climatic data:
  Mean annual precipitation: 6 to 10 inches
  Mean annual air temperature: 51 to 54 degrees F
  Frost-free period: 130 to 160 days
Taxonomic class: Loamy-skeletal over fragmental, mixed, superactive, calcareous, mesic Typic Torriorthents

Typical Pedon

Moncisco extremely gravelly fine sandy loam in an area of mapping unit Chipeta
family—Badland–Moncisco complex, 2 to 45 percent slopes; San Juan County, New Mexico; Great Bend Quadrangle; lat. 36 degrees 10 minutes 33 seconds N. and long. 108 degrees 30 minutes 56 seconds W., NAD 27.

A—0 to 2 inches; brown (10YR 5/3) extremely gravelly fine sandy loam, brown (10YR 4/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; 60 percent gravel and 25 percent channers; very slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C1—2 to 10 inches; brown (10YR 5/3) very channery fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; 40 percent channers; slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C2—10 to 60 inches; brown (10YR 5/3) hard porcelainite fragments with fine sandy loam material in cracks, brown (10YR 4/3) moist; highly fractured platy and angular rock structure; 75 percent channers and 20 percent flagstones.

Range in Characteristics

This soil is a taxadjunct to the Moncisco Series. It does not have a calcic horizon.

Depth to fragmental material: 8 to 20 inches

Reaction: slightly to moderately alkaline

Calcium carbonate equivalent: 0 to 5 percent

Gypsum: 0 to 1

Salinity: EC of 0 to 2 dS/m

Sodicity: SAR 1 to 10

A horizon:

Value: 5 or 6 dry

Chroma: 3 or 4, dry or moist

Rock fragments: average of 60 to 75 percent

Monue Series

*Depth class:* very deep

*Drainage class:* well

*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)

*Geomorphic position:* fan terraces

*Parent material:* eolian material and fan alluvium derived from sandstone

*Elevation:* 5,100 to 6,500 feet

*Slope:* 1 to 12 percent

*Climatic data:*

Mean annual precipitation: 6 to 10 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 130 to 160 days

*Taxonomic class:* Coarse-loamy, mixed, superactive, mesic Typic Haplocambids

**Typical Pedon**

Monue loamy fine sand in an area of mapping unit Moenkopie–Monue complex, 3 to 15 percent slopes; Navajo County, Arizona; Indian Wells Quadrangle; lat. 35 degrees 26 minutes 49 seconds N. and long. 110 degrees 03 minutes 36 seconds W., NAD 27.

A—0 to 3 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/4) moist; single grain; loose, nonsticky and nonplastic; common very fine roots; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bw—3 to 10 inches; light brown (7.5YR 6/4) sandy loam, reddish brown (5YR 4/4) moist; weak coarse subangular blocky; slightly hard, very friable, nonsticky and
Many very fine roots; very few very fine dendritic tubular pores; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

C1—10 to 13 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; very few very fine dendritic tubular pores; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

C2—13 to 31 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 5/4) moist; massive; moderately hard, very friable, nonsticky and nonplastic; common very fine roots; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

C3—31 to 55 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

C4—55 to 80 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; strongly effervescent; strongly alkaline (pH 8.8).

**Range in Characteristics**

Particle-size control section: 8 to 18 percent clay
Reaction: moderately or strongly alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum content: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2

A horizon:
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 to 6, dry or moist

B horizon:
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 4 or 6, dry or moist
- Texture: fine sandy loam, sandy loam, very fine sandy loam, loam

C horizon:
- Hue: 2.5YR, 5YR
- Value: 5 or 6 dry, 4 or 5 moist
- Chroma: 4 or 6, dry or moist
- Texture: fine sandy loam, loamy fine sand

**Monue family**

*Depth class:* very deep
*Drainage class:* somewhat excessively
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)
*Geomorphic position:* fan terraces
*Parent material:* eolian material and fan alluvium derived from sandstone
*Elevation:* 5,100 to 6,000 feet
*Slope:* 2 to 12 percent
*Climatic data:*
  - Mean annual precipitation: 6 to 10 inches
  - Mean annual air temperature: 51 to 54 degrees F
  - Frost-free period: 130 to 160 days
Taxonomic class: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids

Typical Pedon

Monue family in an area of mapping unit Monue family, 1 to 5 percent slopes; Apache County, New Mexico; Standing Horse Mesa Quadrangle; lat. 35 degrees 10 minutes 21 seconds N. and long. 110 degrees 26 minutes 36 seconds W., NAD 27.

A—0 to 2 inches; light brown (7.5YR 6/3) loamy sand, brown (7.5YR 5/3) moist; single grain; loose, nonsticky and nonplastic; common very fine roots; 1 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bw—2 to 10 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine, common fine, and few medium roots; very few very fine dendritic tubular pores; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk1—10 to 20 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4) moist; moderate medium subangular blocky structure; moderately hard, very friable, slightly sticky and moderately plastic; many very fine and few fine roots; common very fine dendritic tubular pores; few masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk2—20 to 39 inches; pink (5YR 7/4) fine sandy loam, reddish brown (5YR 5/4) moist; weak thick platy structure; soft, loose, slightly sticky and moderately plastic; common very fine roots; very few very fine dendritic tubular pores; few masses of calcium carbonate; slightly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk3—39 to 56 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 5/4) moist; massive; soft, loose, slightly sticky and slightly plastic; 5 percent gravel; slightly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

2Bk4—56 to 80 inches; light reddish brown (5YR 6/3) loamy sand, reddish brown (5YR 5/4) moist; massive; soft, loose, nonsticky and nonplastic; 3 percent gravel; slightly effervescent; moderately alkaline (pH 8.2).

Range in Characteristics

Particle-size control section: 5 to 15 percent clay
Rock fragments: 0 to 5 percent gravel
Reaction: slightly to strongly alkaline
Calcium carbonate equivalent: 5 to 30 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2

A horizon:
  Hue: 5YR, 7.5YR
  Value: 4 to 6 dry, 3 to 5 moist
  Chroma: 3 to 6, dry or moist

B horizon:
  Hue: 5YR to 7.5YR
  Value: 3 to 7 dry, 3 to 6 moist
  Chroma: 3 to 6, dry or moist
  Texture: loamy fine sand, sandy loam, fine sandy loam, very fine sandy loam, loam

Nakai Series

Depth class: very deep
Drainage class: well  
Slowest permeability: 0.6 to 2.0 in/hr (moderate)  
Geomorphic position: fan terraces  
Parent material: fan alluvium derived from sandstone and shale  
Elevation: 5,100 to 5,700 feet  
Slope: 1 to 5 percent  
Climatic data:  
   Mean annual precipitation: 6 to 10 inches  
   Mean annual air temperature: 51 to 54 degrees F  
   Frost-free period: 130 to 160 days  
Taxonomic class: Coarse-loamy, mixed, superactive, mesic Typic Haplocalcids  

Typical Pedon

Nakai very fine sandy loam in an area of mapping unit Nakai-Monue very fine sandy loams, 1 to 5 percent slopes; Navajo County, Arizona; about 2.5 miles northwest of Lost Gun Point in the Soil Survey of Hopi Area, Arizona; 1,500 feet west and 2,200 feet south of the northeast corner of sec. 8, T. 25 N, R. 17 E.

A—0 to 3 inches; yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) moist; weak medium platy structure over weak fine subangular blocky; soft, very friable, nonsticky and slightly plastic; few very fine roots; few very fine irregular pores; very slightly effervescent; moderately alkaline; abrupt smooth boundary.

Bk1—3 to 10 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 5/6) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and slightly plastic; many very fine roots; few very fine tubular pores; few fine irregular calcium carbonate accumulations; slightly effervescent (3 percent calcium carbonate); moderately alkaline; clear smooth boundary.

Bk2—10 to 17 inches; yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky and moderately plastic; common very fine roots; common very fine tubular pores; few fine calcium carbonate accumulations; few silt cutans on faces of peds; strongly effervescent (5 percent calcium carbonate); strongly alkaline; clear smooth boundary.

Bk3—17 to 24 inches; yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky and moderately plastic; common very fine roots; common very fine tubular pores; few fine calcium carbonate accumulations; common silt cutans on faces of peds; slightly effervescent (9 percent calcium carbonate); strongly alkaline; clear smooth boundary.

Bk4—24 to 30 inches; brown (7.5YR 5/4) very fine sandy loam, dark brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to medium subangular blocky; hard, friable, moderately sticky and moderately plastic; few very fine roots; few very fine tubular pores; few fine calcium carbonate accumulations; common silt cutans on faces of peds; slightly effervescent (9 percent calcium carbonate); strongly alkaline; clear smooth boundary.

2Bk5—30 to 35 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; very hard, firm, moderately sticky and moderately plastic; few very fine roots; no visible pores; common silt cutans on faces of peds; many fine irregular calcium carbonate accumulations; violently effervescent (20 percent calcium carbonate); strongly alkaline; gradual wavy boundary.

2Bk6—35 to 48 inches; pinkish white (7.5YR 8/2) sandy clay loam, pinkish gray (7.5YR 7/2) moist; weak medium subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; no visible pores; many fine and medium irregular calcium carbonate accumulations; violently effervescent (45 percent calcium carbonate); strongly alkaline; gradual wavy boundary.
2Bk7—48 to 84 inches; light brown (7.5YR 6/4) and pinkish white (7.5YR 8/2) sandy clay loam, brown (7.5YR 5/4) and pinkish gray (7.5YR 7/2) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; many fine and medium irregular calcium carbonate accumulations; violently effervescent (40 percent calcium carbonate); strongly alkaline.

**Range in Characteristics**

- Particle-size control section: 8 to 18 percent clay
- Depth to calcic horizon: 20 to 35 inches
- Rock fragments: 0 to 5 percent
- Reaction: moderately or strongly alkaline
- Calcium carbonate equivalent: 1 to 40 percent
- Gypsum: none
- Salinity: EC of 0 to 2 dS/m
- Sodicity: SAR of 0 to 13; more than 15 below 40 inches in some pedons

**A horizon:**
- Hue: 5YR, 7.5YR
- Value: 5 or 6 dry, 4 or 6 moist
- Chroma: 4 to 6 dry or moist
- Texture: fine sandy loam or sandy loam

**Bk horizon:**
- Hue: 5YR, 7.5YR
- Value: 5 to 8 dry, 4 to 7 moist
- Chroma: 4 or 6, dry or moist
- Texture: very fine sandy loam, fine sandy loam, loamy fine sand when clay-sized carbonates are subtracted

**Narbona family**

- **Depth class:** very deep
- **Drainage class:** well
- **Slowest permeability:** 0.6 to 2.0 in/hr (moderate)
- **Geomorphic position:** stable landslides and summits of plateaus
- **Parent material:** colluvium derived from sandstone
- **Elevation:** 8,000 to 8,600 feet
- **Slope:** 15 to 70 percent
- **Climatic data:**
  - Mean annual precipitation: 18 to 22 inches
  - Mean annual air temperature: 40 to 43 degrees F
  - Frost-free period: 80 to 110 days

**Taxonomic class:** Loamy-skeletal, mixed, superactive, frigid Arenic Haplustalfs

**Typical Pedon**

Narbona family in an area of mapping unit Narbona family-Deza complex, 5 to 50 percent slopes, McKinley County, New Mexico; Chuska Peak Quadrangle; lat. 35 degrees 55 minutes 36 seconds N. and long. 108 degrees 49 minutes 46 seconds W., NAD 27.

**A1**—0 to 5 inches; grayish brown (10YR 5/2) cobbly loamy fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; many very fine roots; 5 percent stones, 15 percent cobbles, 10 percent gravel; noneffervescent; strongly acid (pH 6.0); abrupt smooth boundary.

**A2**—5 to 22 inches; pale brown (10YR 6/3) very cobbly fine sand, yellowish brown (10YR 5/4) moist; single grain; loose, nonsticky and nonplastic; common very fine
and few fine roots; 5 percent stones, 20 percent cobbles, 10 percent gravel; noneffervescent; moderately acid; abrupt smooth boundary.

Bt1—22 to 38 inches; brown (7.5YR 5/4) very cobbly sandy loam, strong brown (7.5YR 4/6) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; clay films bridging sand grains; 5 percent stones, 20 percent cobbles, and 20 percent gravel; noneffervescent; moderately acid; abrupt smooth boundary.

Bt2—38 to 55 inches; light brown (7.5YR 6/4) stony sandy clay loam; brown (7.5YR 5/4) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; clay films on the faces of peds and bridging sand grains; 10 percent stones, 10 percent cobbles, 10 percent gravel; noneffervescent; moderately acid; abrupt smooth boundary.

C—55 to 70 inches; reddish yellow (7.5YR 6/6) stony loamy fine sand; strong brown (7.5YR 5/6) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; 15 percent stones, 10 percent cobbles; noneffervescent; moderately acid.

**Range in Characteristics**

Particle-size control section: averages 8 to 20 percent clay
Rock fragments: average of 35 to 60 percent, dominated by cobble and stone
Calcium carbonate equivalent: none
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
- Hue: 7.5YR, 10YR
- Value: 5 or 6 dry, 3 or 4 moist
- Chroma: 2 or 3, dry or moist
- Texture: loamy fine sand, fine sand
- Rock fragments: 15 to 35 percent

Bt horizon:
- Hue: 5YR, 7.5YR
- Value: 6 or 7 dry, 4 or 5 moist
- Chroma: 2 to 4
- Clay percentage: 5 to 15 in the upper part and 20 to 30 in the lower part
- Texture: sandy clay loam, sandy loam, fine sandy loam.
- Rock fragments: average of 5 to 15 percent

Other features:
Few thin lamellae less than 1 cm thick, totaling less than 1 inch, which have dry value of 5 and chroma as high as 6 are present in some pedons
Some pedons have an E horizon.
Some pedons do not have a C horizon.

**Navajo Series**

*Depth class:* very deep
*Drainage class:* well
*Slowest permeability:* 0.06 to 0.2 in/hr (slow)
*Geomorphic position:* flood plains
*Parent material:* stream alluvium derived from sandstone and shale
*Elevation:* 4,800 to 5,500 feet
*Slope:* 1 to 3 percent
Climatic data:
- Mean annual precipitation: 6 to 10 inches
- Mean annual air temperature: 51 to 54 degrees F
- Frost-free period: 130 to 160 days

Taxonomic class: Fine, mixed, superactive, calcareous, mesic Vertic Torrifluvents

Typical Pedon

Navajo silty clay in an area of mapping unit Navajo silty clay, saline-sodic, 1 to 3 percent slopes; Navajo County, Arizona; about 6 miles north of Winslow in the Soil Survey of Navajo County Area, Arizona, Central Part; 1,320 feet east and 50 feet north of the southwest corner of sec. 23, T. 20 N., R. 15 W.

A—0 to 5 inches; reddish brown (5YR 5/3) silty clay, reddish brown (5YR 4/3) moist; weak medium thick platy structure; hard, firm, very sticky and very plastic; few fine tubular pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C1—5 to 20 inches; reddish brown (5YR 4/4) silty clay, dark reddish brown (2.5YR 3/4) moist; weak medium and coarse angular blocky and moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; many fine irregular and few fine tubular pores; few pressure faces; strongly effervescent; moderately alkaline (pH 8.0); gradual smooth boundary.

C2—20 to 60 inches; reddish brown (2.5YR 4/4) stratified clay, dark reddish brown (2.5YR 3/4) moist; massive; very hard, very firm, very sticky and very plastic; many fine irregular and few fine tubular pores; few small slickensides and pressure faces; few to common very fine strata of silt, silt loam, and loam; strongly effervescent; common fine calcium carbonate filaments and masses; moderately alkaline (pH 8.0).

Range in Characteristics

Particle-size control section: 35 to 50 percent clay
Calcium carbonate equivalent: 1 to 10 percent
Gypsum: none
Salinity: EC of 2 to 16 dS/m
Sodicity: SAR of 0 to 13

A and C horizon:
- Hue: 2.5YR, 5YR, 7.5YR, 10YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 or 4, dry or moist
- Texture: silty clay, clay loam, clay; thin strata of silt, silt loam, and loam is common

Nizhoni family

Depth class: very shallow and shallow
Drainage class: well
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: structural benches on escarpments
Parent material: eolian material and residuum derived from sandstone
Elevation: 7,200 to 7,800 feet
Slope: 15 to 30 percent
Climatic data:
- Mean annual precipitation: 14 to 18 inches
- Mean annual air temperature: 48 to 51 degrees F
Frost-free period: 110 to 140 days

*Taxonomic class:* Loamy, mixed, superactive, calcareous, mesic Lithic Ustorthents

**Typical Pedon**

Nizhoni family in an area of mapping unit Atlatl-Nizhoni family-Rock outcrop complex, 15 to 30 percent slopes; Apache County, Arizona; Buell Park Quadrangle; lat. 35 degrees 58 minutes 55 seconds N. and long. 108 degrees 55 minutes 58 seconds W., NAD 27.

A—0 to 3 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.

C—3 to 12 inches; strong brown (7.5YR 5/6) fine sandy loam, strong brown (7.5YR 4/6) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; slightly effervescent; neutral (pH 7.0); abrupt smooth boundary.

R—12 inches; hard sandstone bedrock.

**Range in Characteristics**

Particle-size control section: 10 to 30 percent clay
Depth to lithic contact: 4 to 20 inches to sandstone
Rock fragments: less than 15 percent
Reaction: slightly acid to moderately alkaline
Gypsum: none
Calcium carbonate equivalent: 1 to 5 percent
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
- Hue: 2.5YR, 10YR
- Value: 5 or 6, dry or moist
- Chroma: 2 to 6, dry or moist

C horizon:
- Hue: 2.5YR, 5YR, 10YR
- Value: 4 to 6 dry, 4 or 5 moist
- Chroma: 2 to 6, dry or moist
- Texture: very fine sandy loam, fine sandy loam, sandy loam, clay loam
- Other features: 0 to 15 percent soft sandstone fragments

**Nomrah Series**

*Depth class:* very deep
*Drainage class:* well
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)
*Geomorphic position:* stable landslides
*Parent material:* eolian material and slope alluvium derived from sandstone
*Elevation:* 6,800 to 7,800 feet
*Slope:* 2 to 10 percent
*Climatic data:*
  - Mean annual precipitation: 14 to 18 inches
  - Mean annual air temperature: 48 to 51 degrees F
  - Frost-free period: 110 to 140 days

*Taxonomic class:* Fine-loamy, mixed, superactive, mesic Calcidic Haplustalfs

**Typical Pedon**

Nomrah fine sandy loam in an area of mapping unit Iwela family-Nomrah-Vosburg
complex, 1 to 40 percent slopes; San Juan County, New Mexico; about 6 miles southwest of Sheep Springs in the Soil Survey of Shiprock Area, Arizona and New Mexico; 1,000 feet north and 1,150 feet east of the southwest corner of sec. 30, T. 22 N., R. 18 W.; lat. 36 degrees 6 minutes 25 seconds N. and long. 108 degrees 48 minutes 18 seconds W., NAD 27.

A—0 to 3 inches; brown (7.5YR 4/2) fine sandy loam, dark brown (7.5YR 3/2) moist; moderate very thick platy structure parting to moderate medium granular; slightly hard, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine irregularly shaped pores; neutral; clear smooth boundary.

Bt1—3 to 8 inches; brown (7.5YR 4/3) sandy clay loam, dark brown (7.5YR 3/3) moist; weak thick platy structure parting to moderate coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few fine and very fine tubular pores; very few distinct clay films on faces of peds and lining pores, and few distinct clay films bridging sand grains; neutral; gradual smooth boundary.

Bt2—8 to 23 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 3/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few coarse and medium, and common fine and very fine roots; few fine and very fine tubular pores; few distinct clay films on faces of peds and lining pores; neutral; clear smooth boundary.

Bt3—23 to 32 inches; yellowish red (5YR 5/6) sandy clay loam, reddish brown (5YR 4/4) moist; weak medium prismatic structure parting to moderate coarse angular blocky; hard, firm, moderately sticky and moderately plastic; common fine and few medium and very fine roots; few medium to very fine tubular pores; few distinct and moderately thick clay films on faces of peds and lining pores; 5 percent gravel; noneffervescent to very slightly effervescent in spots, secondary calcium carbonates segregated as many fine and medium irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; gradual smooth boundary.

Btk1—32 to 43 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few medium to very fine roots; few medium and fine and common very fine tubular pores; very few distinct clay films on faces of peds; 5 percent gravel; violently effervescent, secondary calcium carbonates segregated as many fine and medium irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; gradual smooth boundary.

Btk2—43 to 58 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine and common very fine tubular pores; very few distinct clay films on faces of peds; 10 percent gravel; violently effervescent, secondary calcium carbonates segregated as many fine and medium irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear wavy boundary.

BC—58 to 62 inches; strong brown (7.5YR 5/6) fine sandy loam, strong brown (7.5YR 4/6) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few fine and very fine roots; few fine and very fine tubular pores; 5 percent gravel; very slightly effervescent, secondary calcium carbonates segregated as very few fine irregularly shaped accumulations on rock fragments; slightly alkaline.

Range in Characteristics

Particle-size control section: 20 to 35 percent clay
Rock fragments: 0 to 10 percent
Reaction: slightly acid to moderately alkaline
Calcium carbonate equivalent: 0 to 30 percent
Gypsum: 0 to 1 percent
Salinity: EC of 0 to 2 dS/m  
Sodicity: none  

A horizon:  
  Hue: 5YR, 7.5YR  
  Value: 4 or 5 dry, 3 or 4 moist  
  Chroma: 2 or 3, dry or moist  

Bt horizons:  
  Hue: 5YR, 7.5YR  
  Value: 4 or 5 dry, 3 or 4 moist  
  Chroma: 3 to 6, dry or moist  

Btk and Bk horizons:  
  Hue: 5YR, 7.5YR  
  Value: 6 to 8 dry, 5 to 7 moist  
  Chroma: 3 to 6, dry or moist  
  Texture: sandy clay loam, fine sandy loam  

BC horizon:  
  Hue: 5YR, 7.5YR  
  Value: 5 to 7 dry, 4 or 5 moist  
  Chroma: 2 to 6, dry or moist  

Norkiki family  

Depth class: moderately deep  
Drainage class: well  
Slowest permeability: 0.6 to 2.0 in/hr (moderate)  
Geomorphic position: summits of mesas and hills  
Parent material: eolian material and slope alluvium derived from sandstone and shale  
Elevation: 6,000 to 6,800 feet  
Slope: 1 to 8 percent  
Climatic data:  
  Mean annual precipitation: 6 to 10 inches  
  Mean annual air temperature: 51 to 54 degrees F  
  Frost-free period: 130 to 160 days  

Taxonomic class: Fine-loamy, mixed, active, mesic Typic Haplargids  

Typical Pedon  

Norkiki family in an area of mapping unit Norkiki family-Kimnoli complex, 1 to 8 percent slopes; San Juan County, New Mexico; east of Grey Hill Springs Quadrangle; lat. 36 degrees 02 minutes 48 seconds N. and long. 108 degrees 23 minutes 58 seconds W., NAD 27.  

A—0 to 3 inches; light yellowish brown (2.5Y 6/4) loamy fine sand, light olive brown (2.5Y 5/4) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; 1 percent gravel; noneffervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.  

Bw—3 to 12 inches; olive yellow (2.5Y 6/6) loamy fine sand, light olive brown (2.5Y 5/6) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few fine roots; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.  

Bt—12 to 20 inches; yellowish brown (10YR 5/6) sandy clay loam, dark yellowish brown (10YR 4/6) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common distinct clay
films on faces of peds and bridging sand grains; 2 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C—20 to 30 inches; very pale brown (10YR 7/3) gravelly fine sandy loam, pale brown (10YR 6/3) moist; massive; soft, very friable, slightly sticky and nonplastic; few very fine roots; 20 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

R—30 inches; sandstone bedrock.

Range in Characteristics

Particle-size control section: 18 to 30 percent clay
Depth to lithic contact: 20 to 40 inches
Rock fragments: 0 to 20 percent
Calcium carbonate equivalent: 0 to 5 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 1

A horizon:
  Hue: 7.5YR, 10YR, 2.5Y
  Value: 4 to 6 dry, 3 to 5 moist
  Chroma: 3 or 4, dry or moist

Bt horizon:
  Hue: 7.5YR, 10YR
  Value: 4 or 5 dry, 3 to 5 moist
  Chroma: 4 or 6, dry or moist
  Texture: sandy clay loam, fine sandy loam, sandy loam, clay loam.

Some pedons do not have a Bw horizon.
Some pedons have Btk, Bk, or C horizons.

Notal Series

Depth class: very deep
Drainage class: well
Slowest permeability: 0.06 to .02 in/hr (slow)
Geomorphic position: stream terraces
Parent material: stream alluvium derived from sandstone and shale
Elevation: 5,500 to 6,500 feet
Slope: 0 to 3 percent
Climatic data:
  Mean annual precipitation: 6 to 10 inches
  Mean annual air temperature: 51 to 54 degrees F
  Frost-free period: 130 to 160 days
Taxonomic class: Fine, mixed, active, calcareous, mesic Typic Torriorthents

Typical Pedon

Notal clay loam in an area of mapping unit Notal-Jocity family complex, 0 to 2 percent slopes; San Juan County, New Mexico; Grey Hill Spring Quadrangle; lat. 36 degrees 00 minutes 56 seconds N. and long. 108 degrees 32 minutes 24 seconds W., NAD 27.

A—0 to 3 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; moderate very fine granular; hard, firm, very sticky and very plastic; few
very fine and fine roots; violently effervescent; moderately alkaline (8.0); clear smooth boundary.

C1—3 to 12 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; massive; very hard, very firm, very sticky and very plastic; few very fine roots; violently effervescent; moderately alkaline (8.0); clear smooth boundary.

C2—12 to 25 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; massive; very hard, very firm, very sticky and very plastic; few very fine roots; violently effervescent; moderately alkaline (8.0); abrupt smooth boundary.

Cy1—25 to 38 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; massive; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine masses of gypsum; violently effervescent; moderately alkaline (8.0); abrupt smooth boundary.

Cy2—38 to 45 inches; light yellowish brown (2.5Y 6/4) silt clay loam, light olive brown (2.5Y 5/4) moist; massive; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine masses of gypsum; violently effervescent; moderately alkaline (8.0); abrupt smooth boundary.

Cy3—45 to 60 inches; light olive brown (2.5Y 5/3) clay, olive brown (2.5Y 4/3) moist; massive; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine masses of gypsum; violently effervescent; moderately alkaline (8.0).

Range in Characteristics

Particle-size control section: 35 to 55 percent clay
Reaction: moderately or strongly alkaline
Calcium carbonate equivalent: 1 to 10 percent
Gypsum: 0 to 5 percent
Salinity: EC of 0 to 16 dS/m
Sodicity: SAR of 5 to 30

A horizon:
  Hue: 2.5Y, 10 YR
  Value: 5 to 7 dry, 4 or 5 moist
  Chroma: 3 to 6, dry or moist
  Texture: clay, sandy clay loam, clay loam

Bw Horizons:
  Value: 5 or 6, dry or moist
  Chroma: 2 or 3, dry or moist
  Texture: clay, sandy clay loam, clay loam

C horizons:
  Hue: 10YR, 2.5Y
  Value: 5 to 7 dry, 3 to 5 moist
  Chroma: 3 or 4 dry, 3 to 6 moist
  Texture: clay, clay loam, silty clay

Notal family

Depth class: very deep
Drainage class: well
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Geomorphic position: parna dunes
Parent material: eolian material from sandstone and clay
Elevation: 5,600 to 6,200 feet
Slope: 3 to 15 percent
Climatic data:
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 130 to 160 days

Taxonomic class: Fine, mixed, active, calcareous, mesic Typic Torriorthents

Typical Pedon

Notal family in an area of mapping unit Notal-Notal family complex, 1 to 15 percent slopes; McKinley County, New Mexico; Ear Rock Quadrangle; lat. 35 degrees 56 minutes 22 seconds N. and long. 108 degrees 34 minutes 25 seconds W., NAD 27.

A—0 to 4 inches; light yellowish brown (2.5Y 6/3) clay, light olive brown (2.5Y 5/3) moist; weak very fine granular structure; soft, very friable, moderately sticky and very plastic; many very fine roots throughout; many very fine pores; slightly effervescent; moderately alkaline (pH 8.2); abrupt, smooth boundary

C1—4 to 19 inches; light yellowish brown (2/5Y 6/3) clay, light olive brown (2.5Y 5/3) moist; subangular blocky parting to granular; moderately hard, friable, moderately sticky and very plastic; many very fine and few medium roots; few very fine tubular dendritic pores; slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C2—19 to 47 inches; light yellowish brown (2.5Y 6/3) clay, light olive brown (2.5Y 5/3) moist; strong very fine granular; slightly hard, very friable, moderately stick and very plastic; few very fine and very few fine roots; common very fine medium tubular dendritic pores and very few fine vesicular pores; slightly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C3—47 to 72 inches; light yellowish brown (2.5Y 6/3) clay, light olive brown (2.5Y 5/3) moist; strong very fine granular; hard, friable, moderately sticky and very plastic; very few very fine roots; common very fine tubular dendritic pores; non-effervescent; moderately alkaline (pH 8.0); clear wavy boundary.

2C4—72 to 80 inches; light yellowish brown (2.5Y 6/3) loamy fine sand, light olive brown (2.5Y 5/3) moist; massive; soft, loose, nonsticky and nonplastic; very few very fine roots; non-effervescent; moderately alkaline (pH 8.0).

Range in Characteristics

Particle-size control section: 40 to 60 percent clay
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: 0 to 2 percent
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 13

C horizon
Texture: clay, clay loam

Owlspring Series

Depth class: very deep
Drainage class: somewhat poorly
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Geomorphic position: summits of plateaus
Parent material: alluvium over residuum derived from basalt
Elevation: 8,500 to 9,000 feet
Slope: 1 to 10 percent
Climatic data:
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 40 to 43 degrees F
Frost-free period: 80 to 110 days

**Taxonomic class:** Fine-silty, mixed, superactive, frigid Pachic Argiustolls

**Typical Pedon**

Owlspring loam in an area of mapping unit Tunitcha family-Viewpoint-Owlspring association, 1 to 20 percent slopes; San Juan County, New Mexico; about 9.5 miles west of Sheep Springs in the Soil Survey of Shiprock Area, Arizona and New Mexico; 2,650 feet west and 1,150 feet north of the southeast corner of sec. 28, T. 22 N., R. 19 W.; lat. 36 degrees 6 minutes 27 seconds N. and long. 108 degrees 52 minutes 18 seconds W., NAD 27.

A—0 to 5 inches; brown (7.5YR 4/2) loam, very dark brown (7.5YR 2.5/2.5) moist; common fine distinct dark yellowish brown (10YR 4/4) redox concentrations near root channels; weak thick platy structure parting to moderate fine granular; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine irregularly shaped pores; 5 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—5 to 10 inches; dark reddish brown (5YR 3/2) loam, black (5YR 2.5/1) moist; common fine distinct brown (7.5YR 4/4) redox concentrations near root channels; strong coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few medium, few fine, and common very fine roots; common very fine tubular pores; few distinct clay films on faces of peds and lining pores; slightly acid; clear wavy boundary.

Bt2—10 to 18 inches; very dark gray (5YR 3/1) loam, black (5YR 2.5/1) moist; strong medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few fine and many very fine tubular pores; common distinct clay films on faces of peds and lining pores; slightly acid; clear smooth boundary.

Bt3—18 to 25 inches; very dark gray (5YR 3/1) clay loam, black (5YR 2.5/1) moist; moderate fine prismatic structure parting to weak medium subangular blocky; hard, firm, moderately sticky and moderately plastic; few fine and very few very fine roots; few fine and many very fine tubular pores; few moderately thick and common distinct clay films on faces of peds and lining pores; neutral; clear smooth boundary.

Btgb—31 to 43 inches; pinkish gray (7.5YR 6/2) sandy clay loam, dark reddish brown (5YR 3/2) moist; few fine prominent yellowish red (5YR 4/6) redox concentrations; weak fine prismatic structure parting to strong medium angular blocky; hard, firm, moderately sticky and moderately plastic; few fine and very fine roots; few fine and common very fine tubular pores; many moderately thick clay films on faces of peds; neutral; clear wavy boundary.

BCt—43 to 66 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; common fine prominent strong brown (7.5YR 4/6) redox concentrations; weak coarse prismatic structure parting to moderate coarse subangular blocky; slightly hard, friable, slightly sticky and nonplastic; few very fine roots; few medium and fine and common very fine tubular pores; common distinct clay films on faces of peds; 5 percent gravel; neutral; abrupt wavy boundary.

C1—66 to 72 inches; pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 4/3) moist; common fine prominent yellowish brown (10YR 5/8) redox concentrations; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic;
few very fine roots; few very fine tubular pores; 25 percent gravel and 5 percent cobbles; neutral; abrupt wavy boundary.

2C2—72 to 81 inches; light brownish gray (2.5Y 6/2) with strong brown (7.5YR 5/6) very fine sandy loam, dark grayish brown (2.5Y 4/2) with strong brown (7.5YR 4/6) moist; common medium prominent gray (10YR 5/1) redox depletions and common fine prominent yellowish red (5YR 4/6) redox concentrations; massive; soft, friable, slightly sticky and nonplastic; few very fine roots; few fine and common very fine tubular pores; 10 percent soft tuff fragments; neutral; clear smooth boundary.

2Cr—81 inches; soft, basaltic tuff bedrock.

Range in Characteristics

Particle-size control section: 20 to 27 percent clay
Depth to redoximorphic features: 0 to 20 inches
Rock fragments: average of 0 to 35 percent; 10 to 25 percent gravel, 0 to 10 percent cobbles
Depth to seasonal high water table: 24 to 42 inches
Redoximorphic features: few to common, fine to medium, distinct or prominent, brown, strong brown, yellowish red redox concentrations; strong gleying marked by matrix chroma of 1 or 2, are present in some pedons.
Reaction: slightly acid or neutral
Calcium carbonate equivalent: 0 to 10 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
  Hue: 7.5YR, 10YR, N (neutral)
  Value: 3 or 4 dry, 2 to 3 moist
  Chroma: 0 to 3, dry or moist

Bt horizon:
  Hue: 5YR, 7.5YR, N (neutral)
  Value: 3 or 4 dry, 2 to 3 moist
  Chroma: 0 to 2, dry or moist
  Texture: loam, clay loam

Btb horizon:
  Hue: 5YR, 7.5YR
  Value: 4 to 6 dry, 3 or 4 moist
  Chroma: 2 to 4, dry or moist

BCtb horizon:
  Hue: 7.5YR, 10YR
  Value: 5 or 6 dry, 4 or 5 moist
  Chroma: 2 to 4, dry or moist
  Texture: fine sandy loam, sandy loam

C1 horizon:
  Hue: 7.5YR, 10YR
  Value: 5 or 6 dry, 4 or 5 moist
  Chroma: 3 or 4, dry or moist
  Texture: sandy loam, fine sandy loam

2C2 horizon:
  Hue: 10YR, 2.5Y
  Value: 5 or 6 dry
Chroma: 2 to 6, dry or moist  
Texture: very fine sandy loam, fine sandy loam  
Other features: 10 to 30 percent soft tuff fragments

Parkelei family

Depth class: very deep  
Drainage class: well  
Slowest permeability: 0.6 to 2.0 in/hr (moderate)  
Geomorphic position: drainageways, fan terraces, and summits of mesas and plateaus  
Parent material: eolian material, fan and slope alluvium derived from sandstone and shale  
Elevation: 6,400 to 7,500 feet  
Slope: 1 to 12 percent  
Climatic data:
  - Mean annual precipitation: 14 to 18 inches  
  - Mean annual air temperature: 48 to 51 degrees F  
  - Frost-free period: 110 to 140 days  
Taxonomic class: Fine-loamy, mixed, superactive, mesic Aridic Haplustalfs

Typical Pedon

Parkelei family in an area of mapping unit Parkelei family, 1 to 8 percent slopes; Apache County, Arizona; Cornfields Quadrangle; lat. 35 degrees 45 minutes 38 seconds N. and long. 109 degrees 35 minutes 28 seconds W., NAD 27.

A—0 to 2 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 5/4) moist; weak fine granular structure; soft, loose, nonsticky and nonplastic; common very fine roots; noneffervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

BA—2 to 10 inches; pink (5YR 7/4) sandy loam, reddish brown (5YR 5/4) moist; weak medium angular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and few fine and medium roots; strongly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Bt1—10 to 24 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; moderate medium angular blocky structure; moderately hard, very friable, slightly sticky and slightly plastic; many very fine roots; few very fine and medium dendritic tubular pores; many faint clay films on faces of peds; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bt2—24 to 38 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; moderate medium angular blocky structure; moderately hard, very friable, slightly sticky and slightly plastic; common very fine and medium dendritic tubular pores; many faint clay films on faces of peds; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk1—38 to 50 inches; light reddish brown (5YR 6/4) sandy clay loam, yellowish red (5YR 5/6) moist; weak medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine dendritic tubular pores; few masses of calcium carbonate; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk2—50 to 71 inches; light reddish brown (5YR 6/4) sandy clay loam, yellowish red (5YR 5/6) moist; weak medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; few masses of calcium carbonate; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

2C—71 to 80 inches; light brown (7.5YR 6/4) sand, brown (7.5YR 5/4) moist;
single grain; loose, nonsticky and nonplastic; strongly effervescent; moderately alkaline (pH 8.0).

**Range in Characteristics**

Particle-size control section: 20 to 35 percent clay, greater than 35 percent sand
Rock fragments: 0 to 10 percent gravel and channers
Reaction: neutral to moderately alkaline
Calcium carbonate equivalent: 0 to 10 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

**A horizon:**
- Hue: 5YR, 7.5YR, 10YR
- Value: 3 to 6 dry, 3 to 5 moist
- Chroma: 3 or 4 dry, 2 or 4 moist
- Texture: fine sandy loam, sandy loam, loam

**Bt horizons:**
- Hue: 5YR, 7.5YR, 10YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: sandy clay loam, clay loam

**Btk and Bk horizons:**
- Hue: 5YR, 7.5YR, 10YR
- Value: 3 to 6 dry, 4 to 7 moist
- Chroma: 4 or 6 dry, 2 to 6 moist
- Texture: sandy clay loam, clay loam, sandy loam

**Penistaja family**

*Depth class:* very deep
*Drainage class:* well
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)
*Geomorphic position:* fan terraces
*Parent material:* eolian material and fan alluvium derived from sandstone and shale
*Elevation:* 5,800 to 6,800 feet
*Slope:* 1 to 10 percent
*Climatic data:*
  - Mean annual precipitation: 10 to 14 inches
  - Mean annual air temperature: 50 to 53 degrees F
  - Frost-free period: 120 to 150 days

*Taxonomic class:* Fine-loamy, mixed, superactive, mesic Ustic Haplargids

**Typical Pedon**

Penistaja family in an area of mapping unit Penistaja family-Betonnie complex, 1 to 10 percent slopes; Apache County, Arizona; Greasewood Quadrangle; lat. 35 degrees 30 minutes 35 seconds N. and long. 109 degrees 45 minutes 17 seconds W., NAD 27.

A—0 to 2 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/3) moist; single grain; soft, very friable, nonsticky and nonplastic; common very fine roots; noneffervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bt1—2 to 10 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown
(5YR 5/4) moist; weak medium subangular blocky structure parting to moderate fine granular; moderately hard, very friable, slightly sticky and slightly plastic; many very fine roots; few very fine dendritic tubular pores; few prominent clay films on faces of peds; noneffervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bt2—10 to 21 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 4/3) moist; weak medium subangular blocky structure; moderately hard, very friable, slightly sticky and slightly plastic; common very fine and few fine and medium roots; few very fine dendritic tubular pores; many distinct clay films on faces of peds; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk1—21 to 41 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 5/3) moist; weak medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common very fine roots; few very fine dendritic tubular pores; few masses of calcium carbonate; 2 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk2—41 to 48 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; massive; hard, very friable, slightly sticky and nonplastic; few fine filaments of calcium carbonate; 2 percent gravel; slightly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk3—48 to 59 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; massive; very hard, friable, slightly sticky and moderately plastic; few fine filaments of calcium carbonate; 2 percent gravel; slightly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

C—59 to 80 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4) moist; massive; hard, very friable, nonsticky and nonplastic; few fine filaments of calcium carbonate; slightly effervescent; moderately alkaline (pH 8.2).

**Range in Characteristics**

Particle-size control section: 20 to 35 percent clay, 40 to 80 percent sand with more than 35 percent fine sand or coarser

Rock fragments: 0 to 15 percent

Reaction: neutral to moderately alkaline

Calcium carbonate equivalent: 0 to 5 percent

Gypsum: 0 to 1 percent

Salinity: EC of 0 to 2 dS/m

Sodicity: SAR of 0 to 1

A horizon:

Hue: 5YR, 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 2 to 6, dry or moist

Texture: loamy fine sand, sandy loam, fine sandy loam, loam

Bt horizon:

Hue: 5YR, 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 to 6, dry or moist

Texture: sandy clay loam, clay loam

Some pedons are calcareous in the argillic horizon.

Bk and C horizons:

Hue: 5YR, 7.5YR, 10YR

Value: 4 to 8 dry, 3 to 7 moist

Chroma: 3 to 6, dry or moist

Texture: sandy loam, fine sandy loam, loam, sandy clay loam
Pinavetes family

Depth class: very deep
Drainage class: excessively
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: dunes
Parent material: eolian material derived from sandstone
Elevation: 5,600 to 6,900 feet
Slope: 1 to 60 percent
Climatic data:
  Mean annual precipitation: 10 to 14 inches
  Mean annual air temperature: 50 to 53 degrees F
  Frost-free period: 120 to 150 days
Taxonomic class: Mixed, mesic Ustic Torripsamments

Typical Pedon

Pinavetes family in an area of mapping unit Betonnie-Pinavetes family complex, 3 to 10 percent slopes; Navajo Arizona; Keams Canyon Quadrangle; lat. 35 degrees 45 minutes 27 seconds N. and long. 110 degrees 11 minutes 44 seconds W., NAD 27.

A—0 to 3 inches; light brown (7.5YR 6/4) fine sand, brown (7.5YR 4/3) moist; single grain; loose, nonsticky and nonplastic; common very fine roots; noneffervescent; moderately alkaline (pH 8.0); clear smooth boundary.

C1—3 to 40 inches; light brown (7.5YR 6/4) fine sand, brown (7.5YR 5/4) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; noneffervescent; moderately alkaline (pH 8.2); gradual smooth boundary.

C2—40 to 80 inches; light brown (7.5YR 6/4) fine sand, brown (7.5YR 5/4) moist; single grain; loose, nonsticky and nonplastic; noneffervescent; moderately alkaline (pH 8.2).

Range in Characteristics

Particle-size control section: 0 to 5 percent clay
Rock fragments: 0 to 90 percent
Reaction: slightly to strongly alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
  Hue: 2.5YR, 5YR, 7.5YR, 10YR
  Value: 4 to 6 dry, 3 to 6 moist
  Chroma: 2 to 6, dry or moist
  Texture: loamy fine sand, fine sandy loam, loamy sand, fine sand

C horizon:
  Hue: 7.5YR, 5YR to 10YR
  Value: 4 to 8 dry, 3 to 7 moist
  Chroma: 2 to 8
  Texture: loamy sand, loamy fine sand, sand; fine sandy loam may be present below 40 inches in some pedons

Plumasano Series

Depth class: very deep
Drainage class: well
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: summits of plateaus and side slopes of hills and ridges
Parent material: eolian material and slope alluvium derived from sandstone
Elevation: 6,800 to 7,500 feet
Slope: 5 to 40 percent
Climatic data:
  - Mean annual precipitation: 14 to 18 inches
  - Mean annual air temperature: 48 to 51 degrees F
  - Frost-free period: 110 to 140 days
Taxonomic class: Coarse-loamy, mixed, superactive, mesic Aridic Haplustepts

**Typical Pedon**

Plumasano loamy sand in an area of mapping unit Plumasano-Parkelei family complex, 1 to 15 percent slopes; Apache County, Arizona; Ganado Mesa Quadrangle; lat. 35 degrees, 46 minutes, 40 seconds N. and long. 109 degrees, 34 minutes, 36 seconds W., NAD 27.

A—0 to 2 inches; light brown (7.5YR 6/4) loamy sand, brown (7.5YR 5/4) moist; weak fine granular; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Bw—2 to 10 inches; light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; moderate fine angular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine and very fine roots; few very fine dendritic pores; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk1—10 to 28 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak medium angular blocky structure; moderately hard, friable, nonsticky and nonplastic; few fine and very fine roots; few very fine dendritic pores; very few clay films bridging sand grains; few fine soft calcium carbonate filaments; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk2—28 to 52 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4) moist; massive; moderately hard, friable, nonsticky and nonplastic; few fine soft calcium carbonate filaments; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk3—52 to 80 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; massive; moderately hard, friable, slightly sticky and slightly plastic; very few clay films bridging sand grains; few fine soft calcium carbonate filaments; strongly effervescent; moderately alkaline (pH 8.2).

**Range in Characteristics**

Particle-size control section: 5 to 18 percent clay
Reaction: neutral to moderately alkaline
Calcium carbonate equivalent: 0 to 15 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 5

A horizon:
  - Hue: 7.5YR, 10YR
  - Value: 4 to 6 dry, 3 to 5 moist
  - Chroma: 3 or 4, dry or moist
  - Texture: fine sandy loam or sandy loam

Bw horizon:
  - Hue: 7.5YR, 10YR
  - Value: 4 or 6 dry, 3 to 5 moist
Chroma: 3 or 4 dry, 2 to 6 moist
Texture: sandy loam, loam or fine sandy loam

Bk horizons:
Hue: 5YR, 7.5YR, 10YR
Value: 5 or 6 dry, 3 to 5 moist
Chroma: 3 to 6 dry, 2 to 4 moist
Texture: sandy loam, fine sandy loam, sandy clay loam, loam, loamy sand

Some pedons have a C horizon.

**Polacca Series**

*Depth class: very deep*
*Drainage class: well*
*Slowest permeability: 0.06 to 0.2 in/hr (slow)*
*Geomorphic position: stream terraces*
*Parent material: stream alluvium derived from shale and sandstone*
*Elevation: 5,100 to 6,000 feet*
*Slope: 0 to 3 percent*
*Climatic data:*
  - Mean annual precipitation: 6 to 10 inches
  - Mean annual air temperature: 51 to 54 degrees F
  - Frost-free period: 130 to 160 days
*Taxonomic class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Haplocambids*

**Typical Pedon**

Polacca clay loam in an area of mapping unit Polacca clay loam, 0 to 3 percent slopes; Navajo County, Arizona; about 1.5 miles west of Elbow Point in the Soil Survey of Hopi Area, Arizona; about 2,800 feet west and 500 feet north of the southeast corner of sec. 8, T. 25 N., R. 16 E.

A1—0 to 3 inches; pale brown (10YR 6/3) clay loam, yellowish brown (10YR 5/4) moist; moderate medium platy structure; soft, very friable, moderately sticky and moderately plastic; common very fine roots; many very fine vesicular pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A2—3 to 9 inches; yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) moist; weak medium platy structure; hard, firm, very sticky and very plastic; common very fine roots; few very fine tubular pores; few very fine calcium carbonate accumulations between plates; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A3—9 to 14 inches; light yellowish brown (10YR 6/4) stratified very fine sandy loam and silt loam, yellowish brown (10YR 5/4) moist; moderate medium platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bw—14 to 26 inches; yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, very sticky and very plastic; many very fine roots; many very fine tubular pores; few cutans of silt and organic matter on faces of peds; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2Bk—26 to 33 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; few fine irregular accumulations of calcium carbonate in root channels; organic coatings
on faces of peds; strongly effervescent; moderately alkaline; abrupt smooth boundary.

3C—33 to 84 inches; light yellowish brown (10YR 6/4) loamy sand that has few thin strata of very fine sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; slightly effervescent; moderately alkaline.

**Range in Characteristics**

Particle-size control section: 18 to 35 percent in upper part, 3 to 8 percent in the lower part

Reaction: slightly or moderately alkaline

Calcium carbonate equivalent: 1 to 15 percent

Gypsum: none

Salinity: EC of 0 to 2 dS/m

Sodicity: none

A horizon:

- Value: 4 to 6 dry, 4 or 5 moist
- Chroma: 3 or 4, dry or moist
- Texture: very fine sandy loam to clay and is stratified in most pedons

B horizons:

- Hue: 7.5YR, 10YR
- Value: 5 or 6 dry, 4 or 5 moist
- Chroma: 3 or 4, dry or moist
- Texture: sandy clay loam, clay loam, clay, thin strata of coarser material is common

C horizon:

- Texture: loamy sand, sand; has 2 to 10 thin strata (1 to 5 cm thick) of very fine sandy loam

**Quaman family**

*Depth class:* very deep

*Drainage class:* excessively

*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)

*Geomorphic position:* summits of plateaus

*Parent material:* slope alluvium derived from sandstone

*Elevation:* 7,800 to 9,000 feet

*Slope:* 40 to 80 percent

*Climatic data:*

- Mean annual precipitation: 18 to 22 inches
- Mean annual air temperature: 40 to 43 degrees F
- Frost-free period: 80 to 110 days

*Taxonomic class:* Sandy-skeletal, mixed, frigid Typic Ustorthents

**Typical Pedon**

Nakaibito very channery sandy loam in an area of mapping unit Zilditloi-Nakaibito complex, 40 to 80 percent slopes; McKinley County, New Mexico; Chuska Mountains; lat. 35 degrees 58 minutes 46 seconds N. and long. 108 degrees 51 minutes 43 seconds W., NAD 27.

A—0 to 7 inches; brown (7.5YR 5/2) very channery sandy loam, brown (7.5YR 4/2)
moist; weak fine subangular blocky structure; soft, very friable, nonsticky and
nonplastic; common very fine, few medium roots; common very fine and fine irregular
pores; 40 percent channers; noneffervescent; neutral; clear smooth boundary.

C1—7 to 29 inches; light brown (7.5YR 6/4) very channery loamy sand, brown
(7.5YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very
fine and fine and few medium and coarse roots, common very fine irregular pores; 40
percent channers; noneffervescent; neutral; gradual smooth boundary.

C2—29 to 60 inches; reddish yellow (7.5YR 6/6) very channery loamy sand, strong
brown (7.5YR 5/6) moist; massive; soft, very friable, nonsticky and nonplastic; 40
percent channers; noneffervescent; neutral.

**Range in Characteristics**

Rock fragments: average of 35 to 60 percent in the particle-size control section;
range from 20 to 85 percent in any one subhorizon

Reaction: slightly acid to slightly alkaline

Calcium carbonate equivalent: none

Gypsum: none

Salinity: EC of 0 to 2 dS/m

Sodicity: none

A horizon:

- Hue: 7.5YR, 10YR.
- Value: 5 to 7 dry, 4 to 6 moist
- Chroma: 2 to 4, dry or moist
- Texture: loamy fine sand, loamy sand, sandy loam

C horizon:

- Hue: 7.5YR, 10YR.
- Value: 4 to 7 dry, 3 to 6 moist
- Chroma: 2 to 6, dry or moist
- Texture: sand, fine sand, loamy sand, loamy fine sand

**Querencia Series**

*Depth class:* deep

*Drainage class:* well drained

*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)

*Geomorphic position:* stream terraces

*Parent material:* alluvium derived from sandstone and shale

*Elevation:* 6,200 to 6,500 feet

*Slope:* 0 to 3 percent

*Climatic data:*

- Mean annual precipitation: 10 to 14 inches
- Mean annual air temperature: 51 to 53 degrees F
- Frost-free period: 120 to 150 days

*Taxonomic class:* Fine-loamy, mixed, superactive, mesic Ustic Haplocambids

**Typical Pedon**

Typical pedon of Querencia clay loam, 0 to 3 percent slopes; about 1,100 feet east
and 600 feet north of the intersection of metric coordinates 4006 N. and 551 E.; about
4.5 miles northeast of Big Mountain Dam:

A—0 to 1 inch; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; weak
thin platy structure over weak fine granular; soft, very friable, moderately sticky and
moderately plastic; many very fine roots; many very fine tubular pores; slightly effervescent; mildly alkaline; clear smooth boundary.

Bw1—1 to 7 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; faint discontinuous iron oxide stains on faces of peds; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Bw2—7 to 12 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; common very fine roots; common very fine tubular pores; faint discontinuous iron oxide stains on faces of peds; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Bw3—12 to 33 inches; light yellowish brown (10YR 6/4) sandy clay loam that has thin strata of clay loam and very fine sandy loam, yellowish brown (10YR 5/4) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, firm, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; faint discontinuous iron oxide stains on faces of peds; slightly effervescent; moderately alkaline; abrupt smooth boundary.

2Bk1—33 to 46 inches; pale brown (10YR 6/3) fine sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; common very fine roots; common very fine tubular pores; few fine irregular lime accumulations in pores and root channels; slightly effervescent; mildly alkaline; abrupt smooth boundary.

2Bk2—46 to 84 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; few fine irregular lime accumulations in pores; slightly effervescent; mildly alkaline.

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Reaction: mildly or moderately alkaline
Calcium carbonate equivalent: 0 to 10 percent
Gypsum content: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

Bw horizons:
  Value: 5 or 6 dry, 4 or 5 moist
  Chroma: 3 or 4, dry or 4 moist
  Texture: sandy clay loam, clay loam

Bk horizons:
  Value: 5 or 6 dry, 4 or 5 moist
  Chroma: 3 or 4, dry or moist
  Texture: loam, fine sandy loam

Radnik Series

Depth class: very deep
Drainage class: well
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: flood plains
Parent material: stream alluvium derived from sandstone
Elevation: 5,800 to 7,200 feet
Slope: 0 to 2 percent

Climatic data:
- Mean annual precipitation: 10 to 14 inches
- Mean annual air temperature: 50 to 53 degrees F
- Frost-free period: 120 to 150 days

Taxonomic class: Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torrifluvents

Typical Pedon

Radnik sandy loam in an area of mapping unit San Mateo-Wenota-Radnik complex, 0 to 3 percent slopes; Navajo County, Arizona; First Flat Mesa Quadrangle; lat. 35 degrees 31 minutes 04 seconds N. and long. 110 degrees 08 minutes 32 seconds W., NAD 27.

A—0 to 2 inches; pale brown (10YR 6/3) sandy loam, very dark grayish brown (10YR 3/2) moist; single grain; loose, nonsticky and nonplastic; common very fine roots; 10 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C1—2 to 14 inches; pale brown (10YR 6/3) sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots, few fine; 5 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

C2—14 to 36 inches; pale brown (10YR 6/3) sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots, few fine; 5 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); gradual smooth boundary.

C3—36 to 46 inches; pale brown (10YR 6/3) loamy sand, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; 10 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); gradual smooth boundary.

C4—46 to 80 inches; pale (10YR 76/3) loamy sand, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 8 percent gravel; strongly effervescent; moderately alkaline (pH 8.2).

Range in Characteristics

Particle-size control section: 7 to 18 percent clay
Reaction: moderately alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum content: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
- Hue: 10YR, 7.5YR
- Value: 5 or 6 dry, 3 or 4 moist
- Chroma: 2 to 5, dry or moist
- Texture: fine sandy loam, sandy clay loam, sandy loam

C horizon:
- Hue: 10YR, 7.5YR, 5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 2 to 6, dry or moist
- Texture: fine sandy loam, loamy sand, clay loam, sandy loam, sandy clay loam.
- Stratification: thin strata of finer and coarser material are common
Razito Series

*Depth class:* very deep  
*Drainage class:* excessively  
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)  
*Geomorphic position:* dunes  
*Parent material:* eolian material derived from sandstone  
*Elevation:* 5,800 to 6,500 feet  
*Slope:* 1 to 8 percent  
*Climatic data:*  
  - Mean annual precipitation: 6 to 10 inches  
  - Mean annual air temperature: 51 to 54 degrees F  
  - Frost-free period: 130 to 160 days  
*Taxonomic class:* Mixed, mesic Typic Torripsamments

Typical Pedon

Razito loamy fine sand in an area of mapping unit Razito-Shiprock family complex, 3 to 8 percent slopes; San Juan County, New Mexico; Great Bend Quad; lat. 36 degrees 10 minutes 39 seconds N. and long. 108 degrees 31 minutes 48 seconds W., NAD 27.

A—0 to 4 inches; light yellowish brown (2.5Y 6/3) loamy fine sand, light olive brown (2.5Y 5/3) moist; single grain; loose, nonsticky and nonplastic; few fine and very fine roots; non-effervescent; clear smooth boundary.

C1—4 to 60 inches; light yellowish brown (2.5Y 6/3) loamy fine sand, light olive brown (2.5Y 5/3) moist; single grain; loose, nonsticky and nonplastic; few fine and very fine roots; non-effervescent; slightly alkaline.

C2—28 to 46 inches; light yellowish brown (2.5Y 6/3) loamy fine sand, light olive brown (2.5Y 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; noneffervescent; slightly alkaline.

2Bk—46 to 54 inches; pale yellow (2.5Y 7/4) fine sandy loam, light yellowish brown (2.5Y 6/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine and very fine roots; slightly effervescent; slightly alkaline.

2C—54 to 72 inches; pale yellow (2.5Y 7/4) loamy fine sand, light yellowish brown (2.5Y 6/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine and very fine roots; noneffervescent; slightly alkaline.

Range in Characteristics

Particle-size control section: 5 to 10 percent clay  
*Reaction:* slightly or moderately alkaline  
*Calcium carbonate equivalent:* 0 to 2 percent  
*Gypsum content:* none  
*Salinity:* EC of 0 to 2 dS/m  
*Sodicity:* none

A horizon:  
  - Hue: 10YR, 2.5Y  
  - Value: 5 or 6 dry, 4 or 5 moist  
  - Chroma: 4 or 6 moist

C horizon:  
  - Hue: 10YR, 2.5Y  
  - Value: 4 or 5, dry or moist  
  - Chroma: 4 or 6 moist  
  - Texture: loamy sand, loamy fine sand
Redlands Series

Depth class: very deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: fan terraces
Parent material: stream and fan alluvium derived from sandstone and shale
Elevation: 5,800 to 6,200 feet
Slope: 2 to 8 percent
Climatic data:
  Mean annual precipitation: 6 to 10 inches
  Mean annual air temperature: 51 to 54 degrees F
  Frost-free period: 130 to 160 days
Taxonomic class: Fine-loamy, mixed, superactive, mesic Typic Hapludalfs

Typical Pedon

Redlands fine sandy loam in an area of mapping unit Redlands-Monue complex, 1 to 8 percent slopes; Navajo County, Arizona; Dilkon Quadrangle; lat. 35 degrees 23 minutes 30 seconds N. and long. 110 degrees 21 minutes 15 seconds W., NAD 27.

A—0 to 2 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/3) moist; weak fine granular structure; soft, loose, nonsticky and nonplastic; common very fine roots; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

BA—2 to 9 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; very few very fine dendritic tubular pores; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bt1—9 to 17 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; moderately hard, very friable, slightly sticky and slightly plastic; many very fine roots; few very fine and medium dendritic tubular pores; many distinct clay films on faces of peds; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bt2—17 to 28 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; moderately hard, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine dendritic tubular pores; many distinct clay films on faces of peds; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Btk—28 to 42 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; moderately hard, very friable, slightly sticky and nonplastic; common very fine roots; common very fine dendritic tubular pores; few faint clay films on faces of peds; few very fine filaments of calcium carbonate; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk—42 to 55 inches; reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine filaments of calcium carbonate; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

C—55 to 80 inches; reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline (pH 8.2).

Range in Characteristics

Particle-size control section: 18 to 27 percent clay
Rock fragments: 0 to 15 percent
Reaction: slightly to strongly alkaline
Calcium carbonate equivalent: 0 to 5 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
  Hue: 7.5YR, 5YR, 2.5YR
  Value: 5 or 6 dry, 4 or 5 moist
  Chroma: 2 to 4, dry or moist
  Texture: fine sandy loam, loam

Bt and Btk horizons:
  Hue: 5YR, 2.5YR
  Value: 5 or 6 dry, 4 or 5 moist
  Chroma: 3 to 6, dry or moist
  Texture: loam, fine sandy loam, sandy clay loam

Bk and C horizons:
  Value: 5 to 7 dry, 4 to 6 moist
  Chroma: 2 to 4, dry or moist
  Textures: loam, sandy clay loam, sandy loam

Redlands family

Depth class: very deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: fan terraces
Parent material: eolian material and fan alluvium derived from sandstone and shale
Elevation: 5,800 to 6,400 feet
Slope: 1 to 8 percent
Climatic data:
  Mean annual precipitation: 6 to 10 inches
  Mean annual air temperature: 51 to 54 degrees F
  Frost-free period: 130 to 160 days
Taxonomic class: Fine-loamy, mixed, superactive, mesic Typic Haplargids

Typical Pedon

Redlands family in an area of mapping unit Redlands-Shiprock families complex, 1 to 8 percent slopes; San Juan County, New Mexico; Naschitti Quadrangle; lat. 36 degrees 01 minutes 09 seconds and long. 108 degrees 38 minutes 27 seconds; NAD 27.

A—0 to 2 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; 1 percent gravel; slightly effervescent; abrupt smooth boundary.

Bt—2 to 14 inches; olive yellow (2.5Y 6/6) sandy clay loam, light olive brown (2.5Y 5/6) moist; weak medium and coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few faint clay films on faces of peds and bridging between sand grains; 5 percent gravel; strongly effervescent; clear smooth boundary.

Btk—14 to 40 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few very fine roots; few faint clay films on
faces of peds and bridging between sand grains; few very fine masses of calcium carbonate; 10 percent gravel; strongly effervescent; clear smooth boundary.

Bk—40 to 60 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine masses of calcium carbonate; 6 percent gravel; strongly effervescent.

**Range in Characteristics**

Particle-size control section: 18 to 35 percent clay  
Reaction: slightly or moderately alkaline  
Calcium carbonate equivalent: 1 to 5 percent  
Gypsum: 0 to 2 percent  
Salinity: EC of 0 to 2 dS/m  
Sodicity: SAR of 0 to 2

A horizon:
- Hue: 2.5Y, 10YR  
- Value: 5 or 6 dry, 4 or 5 moist  
- Chroma: 4 or 6, dry or moist  
- Texture: fine sandy loam, loamy fine sand

Bt horizon:
- Hue: 2.5Y, 10YR  
- Value: 4 to 6 dry, 4 or 5 moist  
- Chroma: 4 or 6, dry or moist  
- Texture: sandy clay loam, fine sandy loam

Btk horizon:
- Hue: 2.5Y, 10YR  
- Value: 4 to 6 dry, 4 to 7 moist  
- Chroma: 3 to 5, dry or moist  
- Texture: fine sandy loam, sandy clay loam

Bk horizon:
- Hue: 2.5Y, 10YR  
- Value: 5 to 7 dry, 4 to 6 or 8 moist  
- Chroma: 1 to 4 or 6, dry or moist  
- Texture: sandy clay loam, fine sandy loam, loam, silty clay loam

**Reef family**

*Depth class:* shallow  
*Drainage class:* well  
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)  
*Geomorphic position:* escarpments  
*Parent material:* colluvium over residuum weathered from sandstone and limestone  
*Elevation:* 5,300 to 5,800 feet  
*Slope:* 12 to 45 percent  
*Climatic data:*  
  - Mean annual precipitation: 10 to 14 inches  
  - Mean annual air temperature: 50 to 53 degrees F  
  - Frost-free period: 120 to 150 days  
*Taxonomic class:* Loamy-skeletal, mixed, superactive, mesic Lithic Ustic Torriorthents

**Typical Pedon**

Reef family in an area of mapping unit Kinust-Reef-Tekapo families complex, 1 to
60 percent slopes; Navajo County, Arizona; Sunflower Butte Quadrangle; lat. 35 degrees 17 minutes 35 seconds N. and long. 110 degrees 10 minutes 50 seconds W., NAD 27.

A—0 to 3 inches; light reddish brown (5YR 6/3) very gravelly loam, reddish brown (5YR 5/4) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; 35 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk—3 to 10 inches; light reddish brown (5YR 6/3) very flaggy loam, reddish brown (5YR 5/3) moist; strong medium platy; common very fine and medium and few fine roots; 40 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

R—10 inches; sandstone bedrock.

Range in Characteristics

| Particle-size control section: 10 to 18 percent clay |
| Depth to lithic contact: 10 to 20 inches |
| Rock fragments: 35 to 70 percent |
| Reaction: slightly or moderately alkaline |
| Calcium carbonate equivalent: 0 to 10 percent |
| Gypsum: none |
| Salinity: EC of 0 to 2 dS/m |
| Sodicity: SAR of 0 |

A horizon:

Chroma: 2 to 5

Rizno Series

Depth class: very shallow and shallow
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: structural benches on escarpments
Parent material: colluvium and slope alluvium over residuum derived from sandstone or limestone
Elevation: 6,000 to 6,700 feet
Slope: 2 to 15 percent
Climatic data:

Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 120 to 150 days

Taxonomic class: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents

Typical Pedon

Rizno sandy loam in an area of mapping unit Rizno-Tekapo family-Rock outcrop complex, 2 to 45 percent slopes; Navajo County, Arizona; Ganado Quadrangle; lat. 35 degrees 43 minutes 08 seconds N. and long. 109 degrees 33 minutes 00 seconds W., NAD 27.

A—0 to 2 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 4/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; 5 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C—2 to 11 inches; reddish brown (5YR 5/4) loam, reddish brown (5YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, very friable, moderately
sticky and moderately plastic; many very fine roots; very few very fine pores; 5 percent gravel; violently effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

R—11 inches; hard sandstone bedrock.

Range in Characteristics

Particle-size control section: 10 to 30 percent clay
Depth to lithic contact: 4 to 20 inches to calcareous sandstone and limestone
Rock fragments: 0 to 35 percent as gravel, channers, and cobbles
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 1 to 2 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
  Hue: 2.5YR, 5YR, 7.5YR, 10YR
  Value: 4 to 6 dry, 3 to 5 moist
  Chroma: 3 to 6, dry or moist
  Texture: fine sandy loam, sandy loam, loam, sandy clay loam, clay loam

C horizon:
  Hue: 2.5YR, 5YR
  Value: 4 to 7 dry, 3 to 6 moist
  Chroma: 3 to 6, dry or moist
  Texture: clay loam, fine sandy loam, loam

Royosa Series

Depth class: very deep
Drainage class: excessively
Slowest permeability: 6.0 to 20 in/hr (rapid)
Geomorphic position: dunes
Parent material: eolian material derived from sandstone
Elevation: 6,400 to 7,000 feet
Slope: 1 to 20 percent
Climatic data:
  Mean annual precipitation: 14 to 18 inches
  Mean annual air temperature: 48 to 51 degrees F
  Frost-free period: 110 to 140 days
Taxonomic class: Mixed, mesic Aridic Ustipsamments

Typical Pedon

Royosa fine sand in an area of mapping unit Royosa loamy fine sand, 1 to 15 percent slopes; McKinley County, Arizona; Chafin Hill Quadrangle; lat. 35 degrees 12 minutes 51 seconds N. and long. 109 degrees 02 minutes 43 seconds W., NAD 27.

A—0 to 2 inches; very pale brown (10YR 7/4) fine sand, light yellowish brown (10YR 6/4) moist; single grain; loose, nonsticky and nonplastic; few very fine; neutral (pH 7.0); abrupt smooth boundary.

C1—2 to 60 inches; light yellowish brown (10YR 6/4) fine sand, yellowish brown (10YR 5/4) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; neutral (pH 7.0).

Range in Characteristics

Particle-size control section: 2 to 8 percent clay
Reaction: neutral or slightly alkaline
Calcium carbonate equivalent: 0 to 1 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
Hue: 10YR, 7.5YR
Value: 5 or 7 dry, 3 or 6 moist
Chroma: 2 to 4, dry or moist
Texture: fine sand, loamy fine sand

C horizon:
Hue: 10YR to 5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 3 or 4, dry or moist
Texture: fine sand, loamy fine sand

San Mateo Series

Depth class: very deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: flood plains
Parent material: stream alluvium from mixed sources
Elevation: 5,800 to 7,200 feet
Slope: 0 to 2 percent
Climatic data:
  Mean annual precipitation: 10 to 14 inches
  Mean annual air temperature: 50 to 53 degrees F
  Frost-free period: 120 to 150 days
Taxonomic class: Fine-loamy, mixed, superactive, calcareous, mesic Ustic Torrifluvents

Typical Pedon

San Mateo sandy loam in an area of mapping unit San Mateo-Wenota-Radnik complex, 0 to 3 percent slopes; Navajo County, Arizona; First Flat Mesa Quadrangle; lat. 35 degrees 31 minutes 05 seconds N. and long. 110 degrees 08 minutes 32 seconds W., NAD 27.

A—0 to 3 inches; pale brown (10YR 6/3) sandy loam, dark grayish brown (10YR 4/2) moist; single grain; loose, slightly sticky and nonplastic; many very fine roots; 5 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

AC—3 to 8 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and few fine and medium roots; very few very fine dendritic tubular pores; 2 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

C1—8 to 24 inches; pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; very few very fine dendritic tubular pores; 2 percent gravel; strongly effervescent; moderately alkaline (pH 8.4); clear smooth boundary.

C2—24 to 37 inches; pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2)
moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; very few
very fine dendritic tubular pores; 2 percent gravel; strongly effervescent; moderately
alkaline (pH 8.4); clear smooth boundary.

C3—37 to 57 inches; pale brown (10YR 6/3) loam, grayish brown (10YR 5/2)
moist; massive; soft, loose, slightly sticky and slightly plastic; 2 percent gravel;
strongly effervescent; moderately alkaline (pH 8.4); clear smooth boundary.

C4—57 to 80 inches; pale brown (10YR 6/3) loamy sand, dark grayish brown
(10YR 4/2) moist; massive; soft, loose, nonsticky and nonplastic; 2 percent gravel;
strongly effervescent; moderately alkaline (pH 8.2).

Range in Characteristics

Particle-size control section: 18 to 35 percent clay; more than 15 percent fine sand or
coarser
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 25

A horizon:
  Hue: 10YR, 5YR, 7.5Y
  Value: 4 to 6 dry, 3 or 4 moist
  Chroma: 2 to 4, dry or moist
  Texture: sandy loam, fine sandy loam, loam, clay, sandy loam, clay loam, loamy
   fine sand and sand.
  Other features: horizon does not meet the thickness requirement for a mollic
   epipedon

C horizon:
  Hue: 10YR, 5YR, 7.5YR
  Value: 4 to 7 dry, 2 to 6 moist
  Chroma: 1 to 6, dry or moist
  Texture: stratified sandy loam, fine sandy loam, loam, sandy clay loam, silt loam,
   silty clay loam, clay loam

Sandark family

Depth class: very deep
Drainage class: somewhat excessively
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: summits of plateaus
Parent material: slope alluvium derived from sandstone
Elevation: 7,400 to 8,400 feet
Slope: 1 to 25 percent
Climatic data:
  Mean annual precipitation: 18 to 22 inches
  Mean annual air temperature: 40 to 43 degrees F
  Frost-free period: 80 to 110 days
Taxonomic class: Sandy, mixed, frigid Entic Haplustolls

Typical Pedon

Sandark family in an area of mapping unit Klizhin-Sandark families complex, 20 to
65 percent slopes, San Juan County, New Mexico; Crystal Quadrangle; lat. 36
degrees 04 minutes 21 seconds N. and long. 108 degrees 55 minutes 06 seconds
W., NAD 27.
A—0 to 14 inches; brown (10YR 5/3) loamy fine sand, very dark grayish brown (10YR 3/2) moist; massive; loose, nonsticky and nonplastic; common very fine and fine roots; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.

AC—14 to 24 inches; light yellowish brown (10YR 6/4) sand, brown (10YR 4/3) moist; massive; loose, nonsticky and nonplastic; few coarse roots; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.

C—24 to 60 inches; very pale brown (10YR 8/3) sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; noneffervescent; slightly alkaline (pH 7.4).

**Range in Characteristics**

Particle-size control section: 2 to 8 percent clay
Depth to base of mollic epipedon: 14 to 40 inches
Reaction: slightly acid to slightly alkaline
Calcium carbonate equivalent: none
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizons:
- Value: 3 or 4 dry, 2 or 3 moist
- Chroma: 2 to 5, dry or moist
- Texture: loamy fine sand, loamy sand

Bw horizons (when present):
- Value: 4 or 5 dry, 3 or 4 moist
- Texture: fine sand, loamy fine sand, loamy sand

E and Bt horizons (when present):
- Hue: 10YR, 7.5YR
- Value: 4 or 5 dry, 3 or 4 moist
- Chroma: 2 or 3, dry or moist
- Texture: fine sand, loamy sand, loamy fine sand
- Other features: lamellae are less than 1 cm thick, or are less than 6 inches total within 80 inches

**Sheppard Series**

*Depth class:* very deep
*Drainage class:* somewhat excessively
*Slowest permeability:* 6.0 to 20 in/hr (rapid)
*Geomorphic position:* dunes
*Parent material:* eolian material derived from sandstone
*Elevation:* 4,800 to 6,500 feet
*Slope:* 1 to 15 percent
*Climatic data:
- Mean annual precipitation: 6 to 10 inches
- Mean annual air temperature: 51 to 54 degrees F
- Frost-free period: 130 to 180 days
*Taxonomic class:* Mixed, mesic Typic Torripsamments

**Typical Pedon**

Sheppard loamy sand in an area of mapping unit Sheppard-Monue complex, 1 to 8 percent slopes; Navajo County, Arizona; Satan Butte Quadrangle; lat. 35 degrees 31 minutes 36 seconds N. and long. 109 degrees 53 minutes 36 seconds W., NAD 27.
A—0 to 1 inch; pink (7.5YR 7/4) loamy sand, light brown (7.5YR 6/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; 1 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C1—1 to 4 inches; pink (7.5YR 7/4) loamy sand, light brown (7.5YR 6/4) moist; single grain; loose, nonsticky and nonplastic; many very fine and common fine roots; 1 percent gravel; very slightly effervescent; moderately alkaline (pH 8.2); gradual smooth boundary.

C2—4 to 45 inches; pink (7.5YR 7/4) sand, light brown (7.5YR 6/4) moist; single grain; loose, nonsticky and nonplastic; common very fine and few fine and medium roots; 1 percent gravel; noneffervescent; moderately alkaline (pH 8.2); gradual smooth boundary.

C3—45 to 80 inches; pink (7.5YR 7/4) sand, light brown (7.5YR 6/4) moist; single grain; loose, nonsticky and nonplastic; noneffervescent; moderately alkaline (pH 8.2).

Range in Characteristics

Particle-size control section: 3 to 10 percent clay
Reaction: slightly to strongly alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2

C horizon:
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 5 to 7 dry, 4 to 6 moist
- Chroma: 3 to 6, dry or moist
- Texture: fine sand, clay loam, sandy clay loam, loamy fine sand, sand, loamy sand

Shiprock family

Depth class: very deep
Drainage class: somewhat excessively
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: fan terraces and summits of mesas
Parent material: eolian material and fan alluvium derived from sandstone and shale
Elevation: 5,800 to 6,500 feet
Slope: 1 to 8 percent
Climatic data:
- Mean annual precipitation: 6 to 10 inches
- Mean annual air temperature: 51 to 54 degrees F
- Frost-free period: 130 to 160 days
Taxonomic class: Coarse-loamy, mixed, superactive, mesic Typic Haplargids

Typical Pedon

Shiprock family in an area of mapping unit Redlands-Shiprock families complex, 1 to 8 percent slopes; San Juan County, New Mexico, Naschitti Quadrangle; lat. 36 degrees 01 minutes 19 seconds and long. 108 degrees 38 minutes 32 seconds; NAD 27.

A—0 to 2 inches; light yellowish brown (2.5Y 6/4) loamy fine sand, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; 1 percent gravel; noneffervescent; neutral; abrupt smooth boundary.
Bt1—2 to 14 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; few faint clay films on faces of peds and bridging between sand grains; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bt2—14 to 28 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine irregular pores; few faint clay films on faces of peds and bridging between sand grains; 1 percent gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Btk—28 to 50 inches; pale yellow (2.5Y 7/4) sandy clay loam, light yellowish brown (2.5Y 6/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine irregular pores; few faint clay films on faces of peds and bridging between sand grains; few very fine calcium carbonate masses; 1 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—50 to 60 inches; pale yellow (2.5Y 7/4) fine sandy loam, light yellowish brown (2.5Y 6/4) moist; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine roots; few very fine calcium carbonate masses; slightly effervescent; slightly alkaline.

Range in Characteristics

Particle-size control section: 10 to 18 percent clay
Rock fragments: less than 15 percent
Reaction: neutral to moderately alkaline
Calcium carbonate equivalent: 0 to 5 percent
Gypsum: 0 to 2 percent
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2

A horizon:
Hue: 2.5Y, 10YR
Value: 5 or 6 dry, 4 to 6 moist
Chroma: 4 or 6 moist
Texture: fine sandy loam, loamy fine sand

Bt and Btk horizon:
Hue: 2.5Y, 10YR
Value: 3 to 5 moist
Chroma: 4 or 6 moist

Bk horizon:
Hue: 2.5Y, 10YR
Value: 6 or 7 dry, 4 to 6 moist
Chroma: 4 or 6 moist
Texture: fine sandy loam, loamy fine sand

Some pedons have C horizons with fine sandy loam, sandy loam, loamy fine sand, loamy sand textures.

Skyvillage Series

Depth class: shallow, very shallow
Drainage class: well
Slowest permeability: 2 to 6 in/hr (moderately rapid)
Geomorphic position: plateaus and mesas
Parent material: eolian deposits derived from sandstone
Elevation: 5,900 to 6,700
Slope: 1 to 8 percent
Climatic data:
- Mean annual precipitation: 10 to 14 inches
- Mean annual air temperature: 51 to 53 degrees F
- Frost-free period: 120 to 150 days
Taxonomic class: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents

Typical Pedon

Skyvillage very fine sandy loam in an area of Skyvillage-Rock outcrop complex, 1 to 8 percent slopes, about 7 miles northeast of Keams Canyon; in an unsurveyed area interpolated to be 2,500 feet west and 1,900 feet south of the northeast corner of sec. 24, T. 29 N., R. 20 E.

A—0 to 1 inches; brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/4) moist; weak medium platy structure; soft, very friable, nonsticky and non-plastic; common very fine roots; many very fine vesicular pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—1 to 7 inches; brown (7.5 YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and slightly plastic; many fine roots; common fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C—7 to 11 inches; brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/4) moist; massive; soft, very friable, nonsticky and slightly plastic; common very fine roots; few fine tubular pores; 10 percent gravel; violently effervescent; slightly alkaline; abrupt smooth boundary.

2R—11 inches; sandstone.

Range in Characteristics

Particle-size control section: 5 to 15 percent clay
Depth to bedrock: 6 to 17 inches
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 0 to 10 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

Sogzie Series

Depth class: very deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: fan terrace
Parent material: eolian material and fan alluvium derived from sandstone and siltstone
Elevation: 5,800 to 6,200 feet
Slope: 1 to 4 percent
Climatic data:
- Mean annual precipitation: 6 to 10 inches
- Mean annual air temperature: 51 to 54 degrees F
- Frost-free period: 130 to 160 days
**Taxonomic class:** Coarse-loamy, mixed, superactive, mesic Typic Calciargids

**Typical Pedon**

Sogzie fine sandy loam in an area of mapping unit Sogzie-Monue complex, 1 to 8 percent slopes; Apache County, Arizona; Egloffstein Quadrangle; lat. 35 degrees 30 minutes 52 seconds N. and long. 110 degrees 26 minutes 41 seconds W., NAD 27.

A—0 to 3 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 4/3) moist; single grain; loose, nonsticky and nonplastic; common very fine roots; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bt1—3 to 10 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; very few very fine dendritic tubular pores; few faint clay films on faces of peds; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bt2—10 to 16 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; very few very fine dendritic tubular pores; many distinct clay films on faces of peds; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Btk—16 to 28 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; few very few dendritic tubular pores; common distinct clay films on faces of peds; 2 percent gravel; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk1—28 to 41 inches; pink (7.5YR 8/3) fine sandy loam, pink (7.5YR 7/3) moist; massive; extremely hard, friable, moderately sticky and moderately plastic; many masses of calcium carbonate; 3 percent gravel; violently effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.

Bk2—41 to 48 inches; pinkish white (7.5YR 8/2) loam, pink (7.5YR 8/3) moist; massive; extremely hard, friable, moderately sticky and moderately plastic; many masses of calcium carbonate; 3 percent gravel; violently effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.

C—48 to 62 inches; light reddish brown (5YR 6/3) fine sandy loam, reddish brown (5YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common masses of calcium carbonate; 10 percent gravel; violently effervescent; moderately alkaline (pH 8.2).

**Range in Characteristics**

Particle-size control section: 8 to 18 percent clay

Rock fragments: less than 15 percent

Reaction: slightly alkaline in the surface to strongly alkaline in subsoil

Calcium carbonate equivalent: 0 to 15 percent

Gypsum: none

Salinity: EC of 0 to 2 dS/m

Sodicity: SAR of 0 to 2

A horizon:

Hue: 5YR, 7.5YR

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

B and C horizons:

Hue: 5YR, 7.5YR, 10YR
Value: 5 to 8 dry, 4 to 8 moist  
Chroma: 2 to 6, dry or moist  
Texture: very fine sandy loam, loam, sandy loam, sandy clay loam, clay loam, fine sandy loam

**Somorent family**

*Depth class:* very shallow, shallow  
*Drainage class:* well  
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)  
*Geomorphic position:* erosional remnants hills  
*Parent material:* residuum from shale  
*Elevation:* 5,300 to 6,200 feet  
*Slope:* 1 to 60 percent  
*Climatic data:*  
  - Mean annual precipitation: 6 to 10 inches  
  - Mean annual air temperature: 51 to 54 degrees F  
  - Frost-free period: 130 to 160 days  
*Taxonomic class:* Loamy, mixed, superactive, calcareous, mesic, shallow Typic Torriorthents

**Typical Pedon**

Somorent family in an area of mapping unit Redlands-Somorent family complex, 2 to 6 percent slopes; Navajo County, Arizona; Chimney Butte Quadrangle; lat. 35 degrees 16 minutes 24 seconds N. and long. 110 degrees 26 minutes 38 seconds W., NAD 27.

A—0 to 1 inch; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) moist; weak thin platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few very fine roots; 5 percent gravel; violently effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.

C—1 to 9 inches; reddish yellow (5YR 6/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate thick platy structure parting to weak fine subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine dendritic tubular pores; violently effervescent; strongly alkaline (pH 9.0); abrupt smooth boundary.

Cr—9 inches; fractured mudstone.

**Range in Characteristics**

Particle-size control section: 20 to 35 percent clay  
Depth to lithic contact: 6 to 20 inches to sandstone  
Rock fragments: 0 to 20 percent  
Reaction: moderately or strongly alkaline  
Calcium carbonate equivalent: 0 to 5 percent  
Gypsum: 0 to 2 percent  
Salinity: EC of 0 to 4 dS/m  
Sodicity: SAR of 0 to 13

A horizon:  
  - Hue: 5YR, 2.5YR  
  - Value: 4 to 6 dry  
  - Chroma: 4 or 6, dry or moist

C horizon:  
  - Hue: 5YR, 2.5YR
Value: 3 to 6 dry, 3 to 6 moist
Chroma: 4 or 6, dry or moist
Texture: clay loam, loam, sandy clay loam

**Sonsela Series**

*Depth class:* very deep  
*Drainage class:* well  
*Slowest permeability:* 0.6 to 2.0 in/hr (moderate)  
*Geomorphic position:* summits of plateaus  
*Parent material:* colluvium derived from basalt and tuff-breccia  
*Elevation:* 8,200 to 9,800 feet  
*Slope:* 35 to 70 percent  
*Climatic data:*  
  - Mean annual precipitation: 18 to 22 inches  
  - Mean annual air temperature: 40 to 43 degrees F  
  - Frost-free period: 80 to 110 days  
*Taxonomic class:* Loamy-skeletal, mixed, superactive, frigid Typic Haplustalfs

**Typical Pedon**

Sonsela very stony loam in an area of mapping unit Sonsela-Washpass family-Viewpoint complex, 20 to 70 percent slopes; San Juan County, New Mexico; Narbona Pass Quadrangle; lat. 36 degrees 04 minutes 44 seconds N. and long. 108 degrees 51 minutes 57 seconds W., NAD 27.

- **A**—0 to 3 inches; dark grayish brown (10YR 4/2) very stony loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; 5 percent boulders, 20 percent stones, 10 percent cobbles, and 5 percent gravel; noneffervescent; slightly acid (pH 6.4); abrupt smooth boundary.

- **Bt1**—3 to 12 inches; brown (7.5YR 4/4) very stony loam, dark brown (7.5YR 3/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few faint clay films on faces of peds; 5 percent boulders, 25 percent stones, 5 percent cobbles and 5 percent gravel; noneffervescent; slightly acid (pH 6.4); clear smooth boundary.

- **Bt2**—12 to 22 inches; brown (7.5YR 4/4) very cobbly sandy clay loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine roots; few distinct clay films on faces of peds; 1 percent boulders, 5 percent stones, 30 percent cobbles and 20 percent gravel; noneffervescent; slightly acid (pH 6.4); clear smooth boundary.

- **Bt3**—22 to 40 inches; brown (7.5YR 4/4) very cobbly loam, dark brown (7.5YR 3/4) moist; weak medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few very fine roots; few distinct clay films on faces of peds; 1 percent boulders, 5 percent stones, 30 percent cobbles, and 10 percent gravel; noneffervescent; slightly acid (pH 6.4); abrupt smooth boundary.

- **Bt4**—40 to 60 inches; brown (7.5YR 5/4) very cobbly sandy loam, brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few faint clay films on faces of peds; 1 percent boulders, 5 percent stones, 30 percent cobbles, and 10 percent gravel; noneffervescent; slightly acid (pH 6.4).

**Range in Characteristics**

Particle-size control section: 18 to 27 percent clay
Reaction: slightly acid or neutral
Calcium carbonate equivalent: none
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
  Hue: 5YR, 7.5YR, 10YR
  Value: 3 or 4 dry, 2 to 3 moist
  Texture: loam, fine sandy loam
  Rock fragments: average of 35 to 60 percent; 5 to 25 percent gravel, 10 to 20 percent cobbles, 5 to 20 percent stones, 0 to 5 percent boulders

BA horizon:
  Hue: 5YR, 7.5YR
  Value: 4 or 5 dry, 3 or 4 moist
  Chroma: 3 to 5, dry or moist
  Texture: fine sandy loam, loam
  Rock fragments: average of 15 to 35 percent; 10 to 20 percent gravel, 5 to 10 percent cobbles, 0 to 5 percent stones

Bt horizon:
  Hue: 5YR, 7.5YR
  Value: 4 or 5 dry, 3 or 4 moist
  Chroma: 3 or 4, dry or moist
  Texture: fine sandy loam, sandy clay loam, loam, sandy loam
  Rock fragments: average of 35 to 60 percent; 25 to 35 percent gravel, 10 to 15 percent cobbles, 0 to 10 percent stones

Sparank Series (taxadjunct)

Depth class: very deep
Drainage class: well
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Geomorphic position: flood plains
Parent material: stream alluvium derived from sandstone and shale
Elevation: 6,300 to 7,000 feet
Slope: 0 to 2 percent
Climatic data:
  Mean annual precipitation: 10 to 14 inches
  Mean annual air temperature: 50 to 52 degrees F
  Frost-free period: 120 to 150 days
Taxonomic class: Coarse-loamy over clayey, mixed, superactive, calcareous, mesic
  Ustic Torrifluvents

Typical Pedon

Sparank loamy fine sand in an area of mapping unit Sparank-San Mateo-Zia complex, 0 to 3 percent slopes; McKinley County, New Mexico; Coyote Canyon Quadrangle; lat. 35 degrees, 46 minutes, 31 seconds and long. 108 degrees, 36 minutes, 57 seconds.

A—0 to 3 inches; light yellowish brown (2.5Y 6/4) loamy fine sand, light olive brown (2.5Y 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; 3 percent gravel; slightly effervescent; slightly alkaline (pH 7.4); abrupt wavy boundary.
C1—3 to 16 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/3) moist; single grain; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; slightly effervescent; moderately alkaline (pH 8.0); abrupt wavy boundary.

C2—16 to 53 inches; light yellowish brown (2.5Y 6/4) silty clay, olive brown (2.5Y 4/3) moist; massive; extremely hard, extremely firm, moderately sticky and very plastic; few very fine roots; slightly effervescent; moderately alkaline; abrupt wavy boundary.

C3—53 to 80 inches; light yellowish brown (2.5Y 6/4) loamy fine sand, light yellowish brown (2.5Y 6/3) moist; massive; loose, very friable, nonsticky and nonplastic; few very fine roots; slightly effervescent; slightly alkaline (pH 7.8).

Range in Characteristics

This soil has a coarse-loamy over clayey family particle-size class. It is a taxadjunct to the Sparank series.

Particle-size control section: 35 to 55 percent clay
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: 0 to 2 percent
Salinity: EC of 4 to 8 dS/m
Sodicity: SAR of 0 to 2

A horizon:
- Hue: 10YR, 2.5Y
- Value: 3 to 5 moist, 5 or 6 dry
- Chroma: 2 to 4, dry or moist
- Texture: clay loam, loamy fine sand, fine sandy loam

C horizon:
- Hue: 10YR, 2.5Y
- Value: 3 to 6, dry or moist
- Chroma: 2 to 4, dry or moist
- Texture: clay, sandy clay loam, loamy fine sand, fine sandy loam, silty clay

Sponseller family

Depth class: very deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: fan terraces
Parent material: fan alluvium derived from sandstone and shale
Elevation: 7,500 to 8,200 feet
Slope: 0 to 5 percent
Climatic data:
- Mean annual precipitation: 18 to 22 inches
- Mean annual air temperature: 40 to 43 degrees F
- Frost-free period: 80 to 110 days
Taxonomic class: Fine-loamy, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Sponseller family in an area of mapping unit Sponseller family-Cumulic Endoaquolls complex, 0 to 5 percent slopes; San Juan County, New Mexico; Narbona Pass Quadrangle; lat. 36 degrees 04 minutes 32 seconds N. and long. 108 degrees 49 minutes 45 seconds W., NAD 27.
A—0 to 12 inches; brown (7.5YR 4/2) fine sandy loam, very dark gray (7.5YR 3/1)
moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; noneffervescent; neutral (7.2); abrupt smooth boundary.

Bw—12 to 22 inches; light brown (7.5YR 6/3) fine sandy loam, brown (7.5YR 4/3) moist; weak very fine and fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; noneffervescent; neutral (7.2); clear smooth boundary.

Bt—22 to 30 inches; brownish yellow (10YR 6/6) sandy clay loam, yellowish brown (10YR 5/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few faint clay films on faces of peds; noneffervescent; neutral (7.2); clear smooth boundary.

BC—30 to 60 inches; yellow (10YR 7/6) fine sandy loam, yellowish brown (10YR 5/6) moist; weak medium and coarse subangular blocky; slightly hard, very friable, slightly sticky and nonplastic; noneffervescent; neutral (7.2).

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Rock fragments: 0 to 5 percent
Reaction: neutral or slightly alkaline
Calcium carbonate equivalent: none
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

B horizon:
- Hue: 7.5YR, 10YR
- Value: 6 or 7 dry, 4 or 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: fine sandy loam, sandy clay loam

Stozuni Series

Depth class: very shallow, shallow
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: summits of plateaus
Parent material: slope alluvium derived from sandstone
Elevation: 7,600 to 8,000 feet
Slope: 15 to 45 percent
Climatic data:
- Mean annual precipitation: 18 to 22 inches
- Mean annual air temperature: 40 to 43 degrees F
- Frost-free period: 80 to 110 days
Taxonomic class: Loamy, mixed, superactive, nonacid, frigid Lithic Ustorthents

Typical Pedon

Stozuni loam in an area of mapping unit Manuelito-Klizhin family-Stozuni complex, 8 to 45 percent slopes, McKinley County, New Mexico; Todilto Park Quadrangle; lat. 35 degrees 56 minutes 03 seconds N. and long. 108 degrees 54 minutes 51 seconds W., NAD 27.

Oi—0 to 1 inch; slightly decomposed pine needles.
C—1 to 7 inches; grayish brown (10YR 5/2) loam, grayish brown (10YR 5/2) moist; massive; soft, very friable, slightly sticky, and slightly plastic; few fine roots; 1 percent stones, 2 percent channers, 2 percent cobbles, and 2 percent gravel; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.
R—7 inches; sandstone bedrock.

Range in Characteristics

Particle-size control section: 6 to 18 percent clay
Depth to lithic contact: 4 to 20 inches to sandstone
Rock fragments: 0 to 10 percent gravel or channers, 0 to 10 percent cobbles, 0 to 5 percent stones
Calcium carbonate equivalent: none
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

Strych family

Depth class: very deep
Drainage class: well
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Geomorphic position: hills and stable landslides
Parent material: fan alluvium and colluvium derived from sandstone, shale, and conglomerate
Elevation: 6,000 to 7,000 feet
Slope: 30 to 65 percent
Climatic data:
  Mean annual precipitation: 10 to 14 inches
  Mean annual air temperature: 50 to 53 degrees F
  Frost-free period: 120 to 150 days
Taxonomic class: Loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcids

Typical Pedon

Strych family in an area of mapping unit Kinusta-Strych families-Rock outcrop complex, 30 to 65 percent slopes; Navajo County, Arizona; Greasewood Springs Quadrangle; lat. 35 degrees 28 minutes 01 seconds N. and long. 109 degrees 59 minutes 01 seconds W., NAD 27.

A—0 to 3 inches; brown (7.5YR 5/3) very cobbly sandy clay loam, brown (7.5YR 4/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine, common fine and few medium roots; 25 percent gravel and 25 percent cobbles; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bw—3 to 11 inches; brown (7.5YR 5/3) extremely cobbly loam, brown (7.5YR 4/3) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine, common fine and many medium roots; 20 percent gravel, 45 percent cobbles and 1 percent stones; violently effervescent; moderately alkaline (pH 8.4); gradual smooth boundary.

Bk1—11 to 30 inches; light brown (7.5YR 6/4) extremely cobbly sandy clay loam, brown (7.5YR 5/3) moist; weak medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and few fine and very few medium roots; calcium carbonate coatings on coarse fragments, few coarse calcium carbonate masses; 20 percent gravel, 45 percent cobbles, and 1 percent stones; violently effervescent; strongly alkaline (pH 8.6); gradual smooth boundary.

Bk2—30 to 38 inches; light brown (7.5YR 6/3) extremely cobbly sandy clay loam, brown (7.5YR 4/3) moist; single grain; loose, slightly sticky and slightly plastic; calcium carbonate coating coarse fragments; 20 percent gravel, 65 percent cobbles
and 1 percent stones; violently effervescent; strongly alkaline (pH 8.6); gradual smooth boundary.

C—38 to 60 inches; light brown (7.5YR 6/4) extremely cobbly sandy clay loam, brown (7.5YR 5/4) moist; single grain; loose, slightly sticky and slightly plastic; calcium carbonate coating coarse fragments; 20 percent gravel and 65 percent cobbles; violently effervescent; strongly alkaline (pH 8.8).

**Range in Characteristics**

Particle-size control section: 8 to 35 percent clay
Rock fragments: 0 to 55 percent gravel, 5 to 65 percent cobbles, and 0 to 1 percent stones
Reaction: moderately or strongly alkaline
Calcium carbonate equivalent: 0 to 35 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2

A horizon:
- Value: 5 or 6 dry, 4 or 5 moist
- Chroma: 3 or 4, dry or moist

Btk and Bk horizon:
- Value: 5 to 7 dry, 4 to 6 moist
- Chroma: 3 or 4, dry or moist
- Texture: fine sandy loam, sandy clay loam, sandy loam, clay loam, loam

**Teesto Series**

*Depth class:* very shallow, shallow
*Drainage class:* well
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)
*Geomorphic position:* cinder cones
*Parent material:* eolian material, colluvium, and slope alluvium derived from basalt and other pyroclastic material
*Elevation:* 6,200 to 6,700 feet
*Slope:* 5 to 35 percent
*Climatic data:*
- Mean annual precipitation: 10 to 14 inches
- Mean annual air temperature: 50 to 53 degrees F
- Frost-free period: 120 to 150 days
*Taxonomic class:* Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents

**Typical Pedon**

Teesto very gravelly fine sandy loam in an area of mapping unit Teesto very gravelly fine sandy loam, 5 to 35 percent slopes; Navajo County, Arizona; Indian Wells Quadrangle; lat. 35 degrees 24 minutes 08 seconds N. and long. 110 degrees 03 minutes 17 seconds W., NAD 27.

A—0 to 3 inches; light reddish brown (5YR 6/4) very gravelly fine sandy loam, reddish brown (5YR 4/3) moist; weak fine granular structure; soft, loose, nonsticky and nonplastic; common very fine roots; 40 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk—3 to 9 inches; light reddish brown (5YR 6/3) very gravelly sandy loam, reddish brown (5YR 4/3) moist; massive; soft, loose, nonsticky and nonplastic; common very
fine roots; calcium carbonate coating coarse fragments; 50 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

2R—9 inches; basalt bedrock.

**Range in Characteristics**

Particle-size control section: 18 to 30 percent clay
Depth to lithic contact: 5 to 20 inches
Rock fragments: 10 to 70 percent
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 0 to 5 percent
Salinity: EC of 0 to 2 dS/m
A and B horizons:
  Value: 5 or 6 dry, 3 or 4 moist
  Chroma: 3 or 4, dry or moist
  Texture: sandy loam, fine sandy loam, sandy clay loam, clay loam, loam
C horizon (when present):
  Hue: 10YR, 5YR
  Chroma: 3 or 4, dry or moist
  Texture: loam, sandy clay loam, fine sandy loam, clay loam

**Teesto family**

*Depth class:* very shallow to shallow
*Drainage class:* well
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)
*Geomorphic position:* escarpments of plateaus and mesas and hills and ridges
*Parent material:* Colluvium and residuum derived from sandstone
*Elevation:* 6,300 to 7,400 feet
*Slope:* 2 to 50 percent
*Climatic data:*
  Mean annual precipitation: 10 to 14 inches
  Mean annual air temperature: 50 to 53 degrees F
  Frost-free period: 120 to 150 days
*Taxonomic class:* Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents

**Typical Pedon**

Teesto family in an area of mapping unit Rock outcrop-Eagleeye-Teesto family complex, 35 to 70 percent slopes, Twin Lakes Quadrangle; lat. 35 degrees 39 minutes 48 seconds N. and long. 108 degrees 47 minutes 01 seconds W., NAD 27.

A—0 to 3 inches; pale brown (10YR 6/3) very channery fine sandy loam, brown (10YR 5/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; few fine roots; 40 percent channers; noneffervescent; slightly alkaline; clear smooth boundary.

C—3 to 10 inches; light brownish gray (10YR 6/2) very channery very fine sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; few fine roots; 40 percent channers; slightly effervescent; slightly alkaline.

R—10 inches; sandstone and shale bedrock.

**Range in Characteristics**

Particle-size control section: 5 to 27 percent clay
Depth to lithic contact: 4 to 18 inches
Rock fragments: 35 to 80 percent total; 10 to 80 percent gravel, 36 to 40 percent channers
Reaction: Moderately alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none
A horizon:
  Hue: 7.5YR, 10YR, 2.5Y
  Value: 4 to 7 dry, 4 or 5 moist
  Chroma: 2 to 4 dry, 2 or 3 moist
C horizon:
  Hue: 7.5YR, 10YR, 2.5Y
  Value: 5 to 7 dry, 4 to 6 moist
  Chroma: 4 or 6 dry, 3 to 5 moist
  Texture: loamy fine sand, sandy loam, clay loam, silt loam, fine sandy loam

Tekapo family

Depth class: shallow
Drainage class: well
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Geomorphic position: escarpments of mesas
Parent material: slope alluvium and colluvium over residuum derived from shale
Elevation: 5,300 to 6,700 feet
Slope: 1 to 45 percent
Climatic data:
  Mean annual precipitation: 10 to 14 inches
  Mean annual air temperature: 50 to 53 degrees F
  Frost-free period: 120 to 150 days
Taxonomic class: Clayey, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents

Typical Pedon

Tekapo family in an area of mapping unit Kinusta-Reef-Tekapo families complex, 1 to 60 percent slopes; Apache County, Arizona; Sunflower Butte Quadrangle; lat. 35 degrees 16 minutes 59 seconds N. and long. 110 degrees 10 minutes 46 seconds W., NAD 27.

A—0 to 3 inches; reddish brown (5YR 5/4) channery clay loam, reddish brown (5YR 4/4) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; 20 percent channers; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bw—3 to 8 inches; light reddish brown (2.5YR 6/4) clay loam, reddish brown (2.5YR 5/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and moderately plastic; common very fine and fine roots; few very fine dendritic tubular pores; many clay films on ped faces; violently effervescent; very strongly alkaline (pH 9.2); abrupt smooth boundary.

C—8 to 18 inches; light reddish brown (2.5YR 6/4) clay loam, reddish brown (2.5YR 5/4) moist; massive; hard, friable, moderately sticky and moderately plastic; common very fine roots; few very fine dendritic tubular pores; violently effervescent; very strongly alkaline (pH 9.4); clear smooth boundary.
Cr—18 inches; soft mudstone.

**Range in Characteristics**

- Particle-size control section: 35 to 50 percent clay
- Depth to lithic contact: 6 to 20 inches to sandstone
- Rock fragments: 0 to 50 percent
- Reaction: moderately to very strongly alkaline
- Calcium carbonate equivalent: 0 to 5 percent
- Gypsum: 0 to 1 percent
- Salinity: EC of 0 to 2 dS/m
- Sodicity: SAR of 0 to 2

**A horizon:**
- Hue: 2.5YR, 5YR, 7.5YR, 10YR, 2.5Y
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 1 to 6, dry or moist
- Texture: silty clay loam, clay loam, sandy clay loam, loam

**C horizon:**
- Hue: 2.5YR, 5YR, 7.5YR, 10YR, 2.5Y
- Value: 4 to 6 dry, 5 or 6 moist
- Chroma: 1 to 6, dry or moist
- Texture: silty clay, clay loam, sandy clay loam, silty clay loam

**Tesihim Series**

 Depth class: very shallow  
 Drainage class: somewhat excessively  
 Slowest permeability: 0.6 to 2.0 in/hr (moderate)  
 Geomorphic position: buttes and mesas  
 Parent material: Residuum derived from tuff  
 Elevation: 6,200 to 6,600 feet  
 Slope: 3 to 15 percent  
 Climatic data:  
   - Mean annual precipitation: 10 to 14 inches  
   - Mean annual air temperature: 50 to 53 degrees F  
   - Frost-free period: 120 to 150 days  
 Taxonomic class: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents

**Typical Pedon**

Tesihim very gravelly sandy loam in an area of mapping unit Tesihim complex, 2 to 15 percent slopes; Navajo County, Arizona; Indian Wells Quadrangle; lat. 35 degrees 29 minutes 38 seconds N. and long. 110 degrees 10 minutes 08 seconds W., NAD 27.

A—0 to 1 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam, dark yellowish brown (10YR 3/4) moist; weak coarse platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few fine roots; 40 percent gravel; slightly effervescent; moderately alkaline (pH 8.4); abrupt wavy boundary.

C—1 to 4 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam, dark yellowish brown (10YR 3/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; 25 percent gravel; slightly effervescent; moderately alkaline (pH 8.4); clear wavy boundary.

Cr—4 inches; volcanic tuff.
Range in Characteristics

Particle-size control section: 10 to 35 percent clay, 0 to 35 percent gravel
Depth to paralithic contact: 3 to 15 inches
Rock fragments: 0 to 40 percent
Reaction: moderately or strongly alkaline
Gypsum: none
Calcium carbonate equivalent: 0 to 2 percent
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
  Hue: 5YR, 7.5YR, 10YR
  Value: 4 to 6 dry, 3 or 4 moist
  Chroma: 3 to 6 dry, 2 to 4 moist
  Texture: fine sandy loam, clay loam, fine sand, sandy loam

C horizon:
  Hue: 5YR, 7.5YR, 10YR
  Value: 4 to 7 dry, 3 to 5 moist
  Chroma: 3 to 6, dry or moist
  Texture: fine sand, sandy clay loam, sandy loam, loam

Tewa Series

Depth class: very deep
Drainage class: well
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Geomorphic position: fan terraces
Parent material: fan alluvium derived from shale and sandstone
Elevation: 5,100 to 5,700 feet
Slope: 1 to 5 percent
Climatic data:
  Mean annual precipitation: 6 to 10 inches
  Mean annual air temperature: 51 to 54 degrees F
  Frost-free period: 130 to 160 days
Taxonomic class: Fine-loamy, mixed, superactive, mesic Typic Haplocambids

Typical Pedon

Tewa very fine sandy loam in an area of mapping unit Tewa very fine sandy loam, 1 to 5 percent slopes; Navajo County, Arizona; White Cone Quadrangle; lat. 35 degrees 36 minutes 05 seconds N. and long. 110 degrees 07 minutes 18 seconds W., NAD 27.
  A—0 to 2 inches; light brownish gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; 5 percent gravel; violently effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.
  Bw—2 to 15 inches; light brownish gray (10YR 6/2) fine sandy loam, brown (10YR 4/3) moist; moderate fine angular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; few very fine dendritic tubular pores; violently effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.
  Bk1—15 to 25 inches; light brown (7.5YR 6/3) clay loam, brown (7.5YR 5/3) moist; weak medium subangular blocky structure; moderately hard, friable, slightly sticky and moderately plastic; common very fine roots; common very fine dendritic tubular
pores; few very fine masses of calcium carbonate; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.  
Bk2—25 to 36 inches; light brown (7.5YR 6/3) sandy loam, brown (7.5YR 5/3) moist; weak medium subangular blocky structure; moderately hard, very friable, slightly sticky and slightly plastic; very few very fine roots; few very fine masses of calcium carbonate; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.  
BC—36 to 60 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.  
2C—60 to 80 inches; light yellowish brown (10YR 6/4) sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 10 percent gravel; violently effervescent; moderately alkaline (pH 8.0).

**Range in Characteristics**

Particle-size control section: 18 to 35 percent clay  
Rock fragments: 0 to 10 percent gravel  
Reaction: moderately alkaline  
Calcium carbonate equivalent: 3 to 5 percent  
Gypsum: 0 to 2 percent  
Salinity: EC of 0 to 2 dS/m  
Sodicity: SAR of 0 to 2  

A horizon:  
Hue: 10YR, 7.5YR  
Value: 6 or 7 dry, 4 or 5 moist  
Chroma: 2 to 3, dry or moist  
Texture: sandy loam, loam, fine sandy loam  

Bw horizon:  
Chroma: 2 to 3, dry or moist  
Texture: fine sandy loam, sandy loam  

Bk horizons:  
Hue: 10YR, 7.5YR  
Value: 7 or 6 dry  
Chroma: 3 or 4, dry or moist  
Texture: sandy clay loam, clay loam, sandy loam  

BC or C horizons:  
Hue: 10YR, 7.5YR  
Value: 5 to 7 dry  
Chroma: 2 to 4, dry or moist  
Texture: sandy clay loam, loam, sandy loam, fine sandy loam  

**Toldohn Series**

*Depth class:* very shallow, shallow  
*Drainage class:* well  
*Slowest permeability:* 0.06 to 0.2 in/hr (slow)  
*Geomorphic position:* side slopes of hills and ridges  
*Parent material:* slope alluvium from sandstone and shale  
*Elevation:* 6,900 to 7,500 feet
Slope: 8 to 35 percent

Climatic data:
- Mean annual precipitation: 14 to 18 inches
- Mean annual air temperature: 48 to 51 degrees F
- Frost-free period: 110 to 140 days

Taxonomic class: Clayey, mixed, superactive, nonacid, mesic, shallow Aridic Ustorthents

Typical Pedon

Toldohn clay loam in an area of mapping unit Toldohn-Vessilla-Rock outcrop complex, 8 to 35 percent slopes; McKinley County, New Mexico; Oak Spring Quadrangle; lat. 36 degrees 39 minutes 34 seconds N. and long. 108 degrees 29 minutes 10 seconds W., NAD 27.

**A**—0 to 2 inches; olive (5Y 5/3) clay loam, olive (5Y 4/3) moist; weak fine angular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few very fine roots; few very fine irregular pores; clear smooth boundary.

**C1**—2 to 7 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; slightly hard, firm, very sticky and very plastic; few very fine and fine roots; few very fine irregular pores; slightly effervescent; clear smooth boundary.

**C2**—7 to 15 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; weak fine subangular blocky structure; slightly hard, firm, very sticky and very plastic; few very fine and fine roots; few very fine irregular pores; slightly effervescent (per SOI-232); clear smooth boundary.

**Cr**—15 inches; weathered shale.

Range in Characteristics

Particle-size control section: 30 to 60 percent clay
Depth to lithic contact: 6 to 20 inches to sandstone
Reaction: neutral or slightly alkaline
Calcium carbonate equivalent: none
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2

**A** horizon:
- Hue: 2.5Y, 10YR
- Value: 5 to 7 dry, 4 to 6 moist
- Chroma: 2 to 4, dry or moist

**BC and C** horizons:
- Hue: 2.5Y, 10YR
- Chroma: 2 to 4, dry or moist
- Value: 2 to 7, dry or moist
- Texture: silty clay loam, clay loam, silty clay, clay

Tonalea Series

Depth class: moderately deep
Drainage class: excessively
Slowest permeability: 6.0 to 20 in/hr (rapid)
Geomorphic position: dunes
Parent material: eolian deposits derived from sandstone
Elevation: 5,900 to 6,800
Slope: 5 to 20 percent
Climatic data:
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 120 to 150 days

Taxonomic class: Mixed, mesic Aridic Ustipsamments

**Typical Pedon**

Tonalea fine sand in an area of mapping unit Kydestea-Zyme-Tonalea complex, 5 to 50 percent slopes; about 3,600 feet west and 2,400 feet north of the intersection of metric coordinates 4016 N. and 521 E. in the Soil Survey of Hopi Area, Arizona; about 8.0 miles west of Cottonwood Spring and 0.3 miles north of the Black Mesa pipeline.

A—0 to 3 inches; brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and non-plastic; many very fine roots; many very fine irregular pores; noneffervescent; slightly alkaline; clear smooth boundary.

C1—3 to 11 inches; brown (7.5 YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and non-plastic; many very fine and few coarse roots; many very fine tubular pores; noneffervescent; slightly alkaline; gradual smooth boundary.

C2—11 to 24 inches; yellowish brown (10YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; massive slightly hard, very friable, nonsticky and non-plastic; few fine roots; few fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

2Cr—24 to 26 inches; weathered sandstone.
2R—26 inches; sandstone.

Range in Characteristics

Particle-size control section: 5 to 15 percent clay
Depth to bedrock: 20 to 39 inches
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 0 to 15 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

C horizons:
Texture: sand, loamy sand, loamy fine sand

Torriorthents soils

Depth class: very shallow to very deep
Drainage class: excessively to well drained
Slowest permeability: 0.0015 to 0.06 in/hr (very slow) to 6.0 to 20 in/hr (rapid)
Geomorphic position: hills, buttes, mesas, and escarpments
Parent material: eolian, alluvium, colluvium, and residuum.
Elevation: 4,800 to 6,800 feet
Slope: 1 to 60 percent
Climatic data:
Mean annual precipitation: 6 to 14 inches
Mean annual air temperature: 51 to 56 degrees F
Frost-free period: 130 to 180 days
Taxonomic class: Torriorthents
**Typical Pedon**

The following soil is illustrative of the Torriorthents, Typic Torriorthents, and Ustic Torriorthents soils as used in this survey area. The soil described is in an area of Haplocalcids-Torriorthents-Rock outcrop complex, 15 to 80 percent slopes, in the Soil Survey of Navajo County Area, Arizona, Central Part; on Woodruff Butte, about 3,500 feet north and 2,250 feet east of the southwest corner of sec. 8, T. 16 N., R. 22 E.

A1—0 to 2 inches; brown (7.5YR 4/4) very cobbly silty clay loam, dark brown (7.5YR 3/4) moist; weak fine granular structure; slightly hard, friable, sticky and plastic; common fine and very fine roots; many fine irregular pores; 30 percent cobbles and 20 percent gravel; strongly effervescent; moderately alkaline (pH 8.4); clear smooth boundary.

A2—2 to 8 inches; brown (7.5YR 4/4) very gravelly clay loam, dark brown (7.5YR 3/4) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; many fine and very fine roots; common fine tubular and irregular pores; 35 percent gravel and 10 percent cobbles; strongly effervescent; moderately alkaline (pH 8.4); clear smooth boundary.

C—8 to 32 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; massive; hard, firm, sticky and plastic; common fine and very fine and few medium roots; common fine and very fine tubular pores; 10 percent gravel and 2 percent cobbles; violently effervescent; moderately alkaline (pH 8.4); abrupt smooth boundary.

Cr—32 inches; mudstone.

**Range in Characteristics**

Torriorthents soils are highly variable in regard to the physical and chemical properties that can be observed throughout the survey area.

**Trail Series**

*Depth class:* very deep  
*Drainage class:* somewhat excessively drained  
*Slowest permeability:* 6.0 to 20 in/hr (rapid)  
*Geomorphic position:* flood plains  
*Parent material:* stream alluvium derived from sandstone  
*Elevation:* 5,400 to 6,400 feet  
*Slope:* 0 to 1 percent  
*Climatic data:*  
  - Mean annual precipitation: 6 to 10 inches  
  - Mean annual air temperature: 51 to 54 degrees F  
  - Frost-free period: 130 to 160 days  
*Taxonomic class:* Sandy, mixed, mesic Typic Torrifluvents

**Typical Pedon**

Trail loamy fine sand in an area of mapping unit Trail-Riverwash association, 0 to 1 percent slopes; Navajo County, Arizona; Indian Wells Quadrangle; lat. 35 degrees 23 minutes 46 seconds N. and long. 110 degrees 02 minutes 23 seconds W., NAD 27.

A—0 to 5 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; soft, loose, nonsticky and nonplastic; many very fine roots; very few very fine dendritic tubular pores; strongly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

C1—5 to 13 inches; light brown (7.5YR 6/4) stratified sand, loamy sand, brown (7.5YR 5/4) moist; massive; soft, loose, nonsticky and nonplastic; many very fine
roots; few fine dendritic tubular pores; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

C2—13 to 34 inches; light reddish brown (5YR 6/4) stratified sand, loamy fine sand, reddish brown (5YR 4/4) moist; massive; soft, loose, nonsticky and nonplastic; few very fine roots; very few fine dendritic tubular pores; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

C3—34 to 42 inches; light reddish brown (5YR 6/4) stratified sand, loamy fine sand, reddish brown (5YR 4/4) moist; massive; soft, loose, nonsticky and nonplastic; very few very fine roots; very few fine dendritic tubular pores; strongly effervescent; moderately alkaline (pH 8.4); clear smooth boundary.

C4—42 to 80 inches; light reddish brown (5YR 6/4) stratified sand, loamy fine sand and fine sandy loam, reddish brown (5YR 5/4) moist; massive; soft, loose, nonsticky and nonplastic; very few very fine roots; very few fine dendritic tubular pores; strongly effervescent; strongly alkaline (pH 8.6).

Range in Characteristics

Particle-size control section: 1 to 25 percent clay; greater than 70 percent sand
Rock fragments: 0 to 5 percent gravel
Reaction: moderately or strongly alkaline
Calcium carbonate equivalent: 0 to 2 percent
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2

A and C horizons:
Hue: 7.5YR, 10YR
Value: 5 to 7 dry, 4 to 6 moist
Chroma: 2 to 6 dry, 2 to 4 moist
Texture: loamy sand, loamy fine sand, silt loam, sand

Tunitcha family

Depth class: deep
Drainage class: well
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Geomorphic position: summits of plateaus
Parent material: fan alluvium derived from basalt
Elevation: 8,500 to 9,000 feet
Slope: 5 to 20 percent
Climatic data:
- Mean annual precipitation: 18 to 22 inches
- Mean annual air temperature: 40 to 43 degrees F
- Frost-free period: 80 to 110 days

Taxonomic class: Fine-loamy, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Tunitcha family in an area of mapping unit Tunitcha family-Viewpoint-Owlspring association, 1 to 20 percent slopes; San Juan County, New Mexico; Narbona Pass Quadrangle; lat. 36 degrees 04 minutes 15 seconds N. and long. 108 degrees 51 minutes 48 seconds W., NAD 27.

A—0 to 8 inches; dark brown (7.5YR 3/2) clay loam, very dark gray (7.5YR 3/1) moist; weak fine, medium and coarse subangular blocky structure parting to weak very fine and fine granular; slightly hard, very friable, moderately sticky and moderately plastic; many very fine and fine roots; 1 percent gravel; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.
ABt—8 to 16 inches; brown (7.5YR 5/3) clay loam, brown (7.5YR 4/2) moist; weak very fine, fine, medium and coarse subangular blocky structure; hard, friable, moderately sticky and moderately plastic; many very fine and fine roots; few faint clay films on faces of peds; 1 percent gravel; noneffervescent; neutral (pH 7.0); clear smooth boundary.

Bt1—16 to 28 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; weak very fine, fine, medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few faint clay films on faces of peds; 1 percent gravel; noneffervescent; neutral (pH 7.2); clear smooth boundary.

Bt2—28 to 36 inches; strong brown (7.5YR 4/6) sandy clay loam, dark brown (7.5YR 3/4) moist; weak fine, medium and coarse subangular blocky structure; hard, friable, moderately sticky and moderately plastic; few very fine and fine roots; few faint clay films on faces of peds; 1 percent gravel; noneffervescent; neutral (pH 7.2); clear smooth boundary.

C—36 to 42 inches; brown (7.5YR 4/4) very gravelly sandy clay loam, brown (7.5YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; 50 percent gravel; noneffervescent; slightly alkaline (pH 7.6); clear smooth boundary.

Cr—42 inches; basaltic tuff.

**Range in Characteristics**

**Particle-size control section:** 18 to 30 percent clay
**Depth to lithic contact:** 40 to 60 inches to weathered basalt
**Rock fragments:** 0 to 15 percent
**Reaction:** neutral to moderately alkaline
**Calcium carbonate equivalent:** none
**Gypsum:** none
**Salinity:** EC of 0 to 2 dS/m
**Sodicity:** none

**A horizon:**
- **Hue:** 10YR, 7.5YR
- **Value:** 3 or 4 dry, 2 to 3 moist
- **Chroma:** 1 or 2, dry or moist
- **Texture:** fine sandy loam, loam, clay loam

**Bt horizons:**
- **Hue:** 10YR, 7.5YR
- **Value:** 3 to 5 dry, 2 to 4 moist
- **Chroma:** 1 to 6, dry or moist
- **Texture:** loam, clay loam, sandy clay loam

**C horizons:**
- **Hue:** 10YR, 7.5YR
- **Value:** 3 to 5 dry, 2 to 4 moist
- **Chroma:** 1 to 6, dry or moist
- **Texture:** loam, clay loam, sandy clay loam
- **Rock fragments:** total range is 20 to 60 percent

**Typic Haplocalcids soils**

**Depth class:** very deep
**Drainage class:** well
**Slowest permeability:** 0.6 to 2.0 in/hr (moderate) and 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: mesa escarpments
Parent material: alluvium derived from mixed sources
Slope: 20 to 60 percent
Climatic data:
  - Mean annual precipitation: 6 to 10 inches
  - Mean annual air temperature: 51 to 54 degrees F
  - Frost-free period: 130 to 160 days
Taxonomic class: Typic Haplocalcids

Typical Pedon

The following soil is illustrative of the Typic Haplocalcids as used in this survey area. The soil described is in an area of Torriorthents-Typic Haplocalcids association, 20 to 60 percent slopes; in the Soil Survey of Navajo County Area, Arizona, Central Part; about 8 miles north of Holbrook, about 1,300 feet north and 20 feet west of the southeast corner of sec. 21, T. 21 N., R. 20 E.

A—0 to 3 inches; reddish brown (5YR 5/4) gravelly sandy loam, reddish brown (5YR 4/4) moist; weak thin platy and weak fine granular structure; soft, very friable nonsticky and nonplastic; common very fine roots; many very fine and fine vesicular pores; 30 percent gravel; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Bw—3 to 13 inches; reddish brown (5YR 5/4) coarse sandy loam, reddish brown (5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine tubular pores; 10 percent gravel; slightly effervescent, 13 percent calcium carbonate equivalent; moderately alkaline (pH 8.0); clear smooth boundary.

Bk1—13 to 32 inches; yellowish red (5YR 5/6) gravelly sandy loam, yellowish red (5YR 4/6) moist; massive; hard, friable, slightly sticky and nonplastic; common very fine and fine roots; common very fine and fine tubular pores; 20 percent calcium carbonate-coated gravel; weakly cemented; violently effervescent, 38 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk2—32 to 40 inches; yellowish red (5YR 5/6) gravelly sandy clay loam, yellowish red (5YR 4/6) moist; massive; hard, friable, sticky and slightly plastic; few very fine and fine roots; common very fine and fine tubular pores; 30 percent calcium carbonate-coated gravel; common calcium carbonate masses and fillings in pores; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk3—40 to 56 inches; yellowish red (5YR 5/6) gravelly sandy loam, yellowish red (5YR 4/6) moist; massive; hard, friable, slightly sticky and nonplastic; few very fine and fine roots; common very fine and fine tubular pores; 25 percent calcium carbonate-coated gravel; common calcium carbonate masses and fillings in pores; violently effervescent; 26 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk4—56 to 60 inches; reddish yellow (5YR 6/6) gravelly sandy clay loam, yellowish red (5YR 5/6) moist; weak subangular blocky structure; hard, friable, sticky and slightly plastic; very few very fine roots; common very fine and fine tubular and irregular pores; 30 percent gravel with common calcium carbonate coatings; few calcium carbonate masses and fillings in pores; violently effervescent; 18 percent calcium carbonate equivalent; moderately alkaline (pH 8.4).

Range in Characteristics

Typic Haplocalcids soils are highly variable in regard to the physical and chemical properties that can be observed throughout the survey area.
Typic Torrifluvents soils

Depth class: deep to very deep  
Drainage class: poorly  
Slowest permeability: 0.06 to 0.2 in/hr (slow)  
Geomorphic position: floodplains and stream drainageways  
Parent material: mixed alluvium  
Elevation: 6,400 to 7,000 feet  
Slope: 0 to 5 percent  
Climatic data:  
  Mean annual precipitation: 6 to 10 inches  
  Mean annual air temperature: 51 to 54 degrees F  
  Frost-free period: 130 to 160 days  
Taxonomic class: Typic Torrifluvents

Typical Pedon

The following soil is illustrative of the Typic Torrifluvents as used in this survey area. The soil described is in an area of Riverwash-Typic Torrifluvents complex, 0 to 5 percent slopes; in the Soil Survey of Navajo County Area, Arizona, Central Part; along the Little Colorado River near Winslow; about 2,400 feet south and 2,200 feet west of the northeast corner of sec. 17, T. 19 N., R. 16 E..

C1—0 to 9 inches; light reddish brown (5YR 6/3) sand, reddish brown (5YR 5/3) moist; single grained; loose; many fine and very fine roots; many fine and very fine irregular pores; 5 percent fine gravel; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

C2—9 to 60 inches; light reddish brown (5YR 6/3) stratified loamy sand, reddish brown (5YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; common fine and very fine tubular pores; common thin to moderately thick strata of silt loam, sand, and fine gravel; 10 percent fine gravel; moderately alkaline (pH 8.0).

Range in Characteristics

Typic Torrifluvents soils are highly variable in regard to the physical and chemical properties that can be observed throughout the survey area.

Umbarg family

Depth class: very deep  
Drainage class: well  
Slowest permeability: 0.6 to 2.0 in/hr (moderate)  
Geomorphic position: stream terraces  
Parent material: stream alluvium derived from sandstone and shale  
Elevation: 7,600 to 8,000 feet  
Slope: 1 to 3 percent  
Climatic data:  
  Mean annual precipitation: 14 to 18 inches  
  Mean annual air temperature: 48 to 51 degrees F  
  Frost-free period: 110 to 140 days  
Taxonomic class: Fine-loamy, mixed, superactive, mesic Cumulic Haplustolls

Typical Pedon

Umbarg family in an area of mapping unit Umbarg-Millpaw families complex, 1 to 3 percent slopes; San Juan County, New Mexico; Crystal Quadrangle; lat. 36 degrees
A—0 to 2 inches; grayish brown (10YR 5/2) loam, very dark brown (10YR 2/2) moist; weak very fine and fine subangular blocky structure; slightly hard to hard, friable, moderately sticky and moderately plastic; many very fine and fine roots; non-effervescent; neutral (pH 7.2); abrupt smooth boundary.

Bw1—2 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine and fine roots; non-effervescent; neutral (pH 7.2); abrupt smooth boundary.

Bw2—9 to 14 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; very few very fine roots; non-effervescent; neutral (pH 7.2); abrupt smooth boundary.

Bw3—14 to 40 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak very fine and fine subangular blocky structure; slightly hard to hard, very friable, slightly sticky and nonplastic; very few very fine roots; non-effervescent; neutral (pH 7.2); abrupt smooth boundary.

BC—40 to 70 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak very fine and fine subangular blocky structure; hard, friable, nonsticky and nonplastic; very few very fine roots; non-effervescent; neutral (pH 7.2).

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Reaction: neutral to moderately alkaline
Calcium carbonate equivalent: 0 to 10 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
   Value: 4 or 5 dry, 2 or 3 moist
   Chroma: 1 to 3, dry or moist
   Texture: loam, silty clay loam, fine sandy loam, silt loam

B and C horizons:
   Value: 3 or 5 dry, 2 to 4 moist
   Chroma: 1 to 3, dry or moist
   Texture: loam, silt loam, silty clay loam, fine sandy loam

Venable family

Depth class: very deep
Drainage class: very poorly
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Geomorphic position: summits of plateaus
Parent material: Lacustrine sediments and slope alluvium derived from sandstone
Elevation: 8,500 to 9,200 feet
Slope: 0 to 1 percent
Climatic data:
   Mean annual precipitation: 18 to 22 inches
   Mean annual air temperature: 40 to 43 degrees F
   Frost-free period: 80 to 110 days
Taxonomic class: Fine-loamy, mixed, superactive Cumulic Cryaquolls
Typical Pedon

Venable family in an area of mapping unit Akhoni-Venable families complex, 0 to 15 percent slopes, McKinley County, New Mexico; Narbona Pass Quadrangle; lat. 36 degrees 00 minutes 06 seconds N. and long. 108 degrees 48 minutes 54 seconds W., NAD 27.

Oi—0 to 1 inch; dead grass and pine needles; abrupt smooth boundary.

A1—1 to 5 inches; very dark gray (7.5YR 3/1) mucky loam, black (7.5YR 2.5/1) moist; weak fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine and few fine roots; noneffervescent; abrupt smooth boundary.

A2—5 to 9 inches; very dark gray (7.5YR 3/1) mucky clay loam, black (7.5YR 2.5/1) moist; weak medium and coarse subangular blocky structure; very hard, very firm, moderately sticky and moderately plastic; few very fine and fine roots; noneffervescent; abrupt wavy boundary.

Bg1—9 to 15 inches; very dark gray (7.5YR 3/1) clay, black (7.5YR 2.5/1) moist, weak coarse and very coarse subangular blocky structure parting to weak fine and medium prismatic; extremely hard, extremely firm, moderately sticky and moderately plastic; few very fine and fine roots; common fine tubular pores; brown (7.5YR 5/2) redox concentrations; noneffervescent; abrupt smooth boundary.

Bg2—15 to 35 inches; dark gray (7.5YR 4/1) sandy clay loam, very dark gray (7.5YR 3/1) moist, weak fine and medium subangular blocky structure; moderately hard, friable, moderately sticky and moderately plastic; very pale brown (10YR 8/2) and strong brown (7.5 YR 4/6) redox concentrations; noneffervescent; abrupt smooth boundary.

Cg1—35 to 43 inches; brown (7.5 YR 4/2) moist; sandy clay loam, massive; moderately hard, friable, moderately sticky and slightly plastic; very pale brown (10YR 8/2) and yellowish brown (10YR 5/6) redox concentrations; noneffervescent; clear smooth boundary.

Cg2—43 to 51 inches; pale brown (10YR 6/3) moist; sandy loam, massive; slightly hard, very friable, slightly sticky and slightly plastic; yellowish brown (10YR 5/6) redox concentrations; noneffervescent; abrupt smooth boundary.

Cg3—51 to 60 inches; white (10YR 8/1) moist; sandy loam, massive; slightly hard, very friable, slightly sticky and slightly plastic; brownish yellow (10YR 6/8) redox concentrations; noneffervescent.

Range in Characteristics

Particle-size control section: 18 to 35 percent clay
Rock fragments: 0 to 5 percent
Reaction: moderately acid to neutral
Calcium carbonate equivalent: none
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

Typically, the soil moisture control section is saturated and ponded to as much as 4 feet most of the year. Peraquic moisture regime.

A horizons:
  Hue: N (neutral), 10YR, 7.5YR
  Value: 3 or 4 dry, 2 to 3 moist
  Chroma: 0 or 1, dry or moist
  Texture: mucky loam, mucky silt loam, or mucky clay loam

Bg horizons:
  Hue: N (neutral), 10YR, 7.5YR
Value: 3 or 4 dry, 2 to 3 moist
Chroma: 0 or 1, dry or moist
Texture: sandy clay loam, clay loam or clay
Redoximorphic features: few to common, fine to medium, distinct or prominent redox concentrations

Cg horizons:
Hue: 10YR, 7.5YR
Value: 5 to 8 dry, 4 to 8 moist
Chroma: 1 to 4, dry or moist
Texture: stratified fine sandy loam to silt clay
Redoximorphic features: few to common, fine to medium, distinct or prominent redox concentrations; a reduced matrix may be present

Venadito Series

Depth class: very deep
Drainage class: well
Slowest permeability: 0.01 to 0.06 in/hr (very slow)
Geomorphic position: fan terraces and stream terraces
Parent material: fan and stream alluvium derived from shale
Elevation: 6,500 to 7,000 feet
Slope: 1 to 6 percent
Climatic data:
  Mean annual precipitation: 10 to 12 inches
  Mean annual air temperature: 50 to 53 degrees F
  Frost-free period: 120 to 150 days
Taxonomic class: Very-fine, smectitic, mesic Chromic Haplotorrerts

Typical Pedon

Venadito clay in an area of mapping unit Venadito clay, 1 to 6 percent slopes; Navajo County, Arizona; Red Clay Wash Quadrangle; lat. 35 degrees 51 minutes 22 seconds N. and long. 109 degrees 24 minutes 56 seconds W., NAD 27.
  A—0 to 2 inches; reddish brown (2.5YR 5/3) clay, reddish brown (2.5YR 4/3) moist; strong fine granular structure; soft, loose, moderately sticky and moderately plastic; many very fine roots; 2 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.
  Bss1—2 to 40 inches; reddish brown (2.5YR 5/3) clay, dark reddish brown (2.5YR 4/3) moist; strong coarse angular blocky structure; very hard, hard, moderately sticky and very plastic; many very fine roots; few very fine dendritic tubular pores; many distinct clay films on ped faces; intersecting slickensides; slightly effervescent; moderately alkaline (pH 8.2); clear boundary.
  Bss2—40 to 55 inches; reddish brown (2.5YR 5/3) clay, reddish brown (2.5YR 4/3) moist; strong medium subangular blocky; extremely hard, hard, moderately sticky and moderately plastic; common very fine roots; many distinct clay films on ped faces; intersecting slickensides; slightly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.
  Bss3—55 to 60 inches; reddish brown (2.5YR 5/3) clay, reddish brown (2.5YR 4/3) moist; strong medium subangular blocky; extremely hard, hard, moderately sticky and very plastic; very few very fine calcium carbonate masses; intersecting slickensides; slightly effervescent; moderately alkaline (pH 8.4); abrupt smooth boundary.
  2R—60 inches; sandstone bedrock.
Range in Characteristics

Particle-size control section: 60 to 80 percent clay
Vertic properties: slight gilgai on surface, self-mulching surface, 0.5-inch-wide cracks extend from the surface to 20 inches or more, pressure faces, and slickensides are present below 2 inches.
Calcium carbonate equivalent: 0 to 5 percent
Gypsum: 0 to 1 percent
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 5

A horizon:
- Hue: 2.5YR, 5YR
- Value: 3 or 4 dry
- Texture: clay, clay loam

Bss horizons (BC horizons when present):
- Hue: 2.5YR, 5YR
- Value: 3 to 5 dry
- Chroma: 3 or 4 moist
- Texture: clay, silty clay

Venzuni Series

Depth class: very deep
Drainage class: well
Slowest permeability: 0.01 to 0.06 in/hr (very slow)
Geomorphic position: fan terraces and stream terraces
Parent material: fan and stream alluvium derived from shale
Elevation: 6,700 to 7,600 feet
Slope: 1 to 10 percent

Climatic data:
- Mean annual precipitation: 14 to 18 inches
- Mean annual air temperature: 48 to 51 degrees F
- Frost-free period: 110 to 140 days

Taxonomic class: Very-fine, smectitic, mesic Aridic Haplusterts

Typical Pedon

Venzuni clay loam in an area of mapping unit Venzuni clay loam, 1 to 10 percent slopes; Navajo County, Arizona; Red Clay Wash Quadrangle; lat. 35 degrees 52 minutes 01 seconds N. and long. 109 degrees 23 minutes 49 seconds W., NAD 27.
A—0 to 1 inch; reddish brown (5YR 5/3) clay loam, dark reddish brown (5YR 3/3) moist; moderate fine granular structure; soft, loose, moderately sticky and moderately plastic; common very fine roots; 5 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.
Bss1—1 to 6 inches; reddish brown (5YR 5/3) clay loam, dark reddish brown (5YR 3/3) moist; strong medium subangular structure; moderately hard, very friable, moderately sticky and very plastic; common very fine and few fine and medium roots; many faint clay skins on ped faces; very few very fine tubular pores; intersecting slickensides; slightly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.
Bss2—6 to 25 inches; reddish brown (5YR 5/3) clay, reddish brown (5YR 4/3) moist; massive; extremely hard, very firm, moderately sticky and very plastic; very few
very fine roots; very few fine tubular pores; intersecting slickensides; many distinct clay films on ped faces; slightly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bss3—25 to 66 inches; weak red (2.5YR 5/2) clay, dusky red (2.5YR 3/2) moist; massive; extremely hard, very firm, moderately sticky and very plastic; many distinct clay films on ped faces; intersecting slickensides; slightly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk—66 to 80 inches; weak red (2.5YR 5/2) clay, dusky red (2.5YR 3/2) moist; massive; extremely hard, very firm, moderately sticky and very plastic; many faint clay films on ped faces; few calcium carbonate masses; slightly effervescent; moderately alkaline (pH 8.2).

**Range in Characteristics**

Particle-size control section: 60 to 80 percent clay
Vertic properties: slight gilgai on surface, self-mulching surface, 0.5-inch-wide cracks extend from the surface to a depth of 20 inches or more, pressure faces and slickensides are present below 2 inches.
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 5 to 10 percent
Gypsum: none
Salinity: EC of 2 to 4 dS/m
Sodicity: SAR of 0 to 5

A horizon:
- Hue: 2.5YR, 5YR
- Value: 3 or 4 dry
- Texture: silty clay, clay loam

Bss horizons:
- Hue: 2.5YR, 5YR
- Value: 3 to 5 dry
- Chroma: 3 or 4 moist
- Texture: clay, silty clay

Bk horizons:
- Hue: 2.5YR, 5YR
- Value: 3 to 5 dry
- Chroma: 3 or 4 moist

**Verite Series**

*Depth class:* very shallow and shallow
*Drainage class:* well
*Slowest permeability:* 0.2 to 0.6 in/hr (moderately slow)
*Geomorphic position:* summits of plateaus and mesas
*Parent material:* eolian material over residuum derived from sandstone and shale
*Elevation:* 7,500 to 8,000 feet
*Slope:* 1 to 45 percent
*Climatic data:*
  - Mean annual precipitation: 18 to 22 inches
  - Mean annual air temperature: 46 to 48 degrees F
  - Frost-free period: 110 to 130 days
*Taxonomic class:* Loamy, mixed, superactive, mesic Lithic Haplustalfs
Typical Pedon

Verite fine sandy loam in an area of mapping unit Verite-Manuelito complex, 1 to 8 percent slopes; Apache County, Arizona; Piney Hill Quadrangle; lat. 35 degrees 45 minutes 45 seconds N. and long. 109 degrees 11 minutes 12 seconds W., NAD 27.
A—0 to 2 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 3/3) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; 2 percent gravel; noneffervescent; neutral (pH 6.6); abrupt smooth boundary.
Bt1—2 to 6 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; moderately hard, friable, slightly sticky and moderately plastic; many very fine, few fine and medium roots; many very fine dendritic tubular pores; common distinct clay films on faces of peds; 4 percent gravel; noneffervescent; neutral (pH 6.6); clear smooth boundary.
Bt2—6 to 11 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; moderately hard, friable, moderately sticky and moderately plastic; many very fine and common fine and medium roots; common very fine dendritic tubular pores; common distinct clay films on faces of peds; 7 percent gravel; noneffervescent; neutral (pH 6.8); abrupt smooth boundary.
R—11 inches; hard sandstone bedrock.

Range in Characteristics

Particle-size control section: 5 to 35 percent clay
Depth to lithic contact: 6 to 20 inches to sandstone
Rock fragments: 0 to 10 percent
Reaction: neutral
Salinity: EC of 0 to 2 dS/m
A horizon:
  Hue: 5YR, 10YR, 7.5YR
  Value: 4 to 7 dry, 3 to 5 moist
  Chroma: 2 to 4 dry or moist
  Texture: fine sandy loam, clay loam, loamy fine sand, fine sandy loam or loam

Bt horizon:
  Hue: 5YR, 7.5YR to 10YR
  Value: 4 to 6 dry, 3 to 5 moist
  Chroma: 3 to 6 dry or moist
  Texture: sandy clay loam, clay loam, loamy fine sand, fine sandy loam or loam

Vessilla Series

Depth class: very shallow, shallow
Drainage class: well
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: side slopes of hills and ridges and structural benches on escarpments
Parent material: slope alluvium derived from sandstone
Elevation: 6,300 to 8,000 feet
Slope: 5 to 70 percent
Climatic data:
  Mean annual precipitation: 14 to 18 inches
Mean annual air temperature: 48 to 51 degrees F
Frost-free period: 110 to 140 days

**Taxonomic class:** Loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthents

**Typical Pedon**

Vessilla fine sandy loam in an area of mapping unit Evpark-Vessilla-Arabrab complex, 1 to 25 percent slopes; Apache County, Arizona; Ganado Mesa Quadrangle; lat. 35 degrees 46 minutes 53 seconds N. and long. 109 degrees 33 minutes 29 seconds W., NAD 27.

A1—0 to 2 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; weak fine granular structure; soft, loose, nonsticky and nonplastic; common very fine roots; 14 percent gravel; violently effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

A2—2 to 5 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/3) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; very few very fine dendritic tubular pores; 10 percent gravel; violently effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C1—5 to 11 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

C2—11 to 15 inches; very pale brown (10YR 7/3) loamy fine sand, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

R—15 inches; hard sandstone bedrock.

**Range in Characteristics**

Particle-size control section: 12 to 25 percent clay
Depth to lithic contact: 4 to 20 inches to sandstone
Rock fragments: 0 to 5 percent cobbles or flagstone, 0 to 30 percent gravel, and 0 to 15 percent channers
Reaction: slightly or moderately alkaline
Calcium carbonate equivalent: 0 to 2 percent
Salinity: EC of 0 to 2 dS/m

A and C horizon:
- **Hue:** 2.5YR, 5YR, 7.5YR, 10YR
- **Value:** 4 to 7 dry, 4 to 6 moist
- **Chroma:** 3 to 6, dry or moist
- **Texture:** sandy loam, sandy clay loam, fine sandy loam, loamy fine sand

**Viewpoint Series**

**Depth class:** shallow
**Drainage class:** well
**Slowest permeability:** 0.6 to 2.0 in/hr (moderate)
**Geomorphic position:** summits of plateaus
**Parent material:** colluvium and residuum derived from basalt and tuff-breccia
**Elevation:** 8,200 to 9,800 feet
**Slope:** 2 to 35 percent
**Climatic data:**
- Mean annual precipitation: 18 to 22 inches
- Mean annual air temperature: 40 to 43 degrees F
- Frost-free period: 80 to 110 days
Taxonomic class: Loamy, mixed, superactive, frigid Lithic Argiustolls

Typical Pedon

Viewpoint in an area of mapping unit Sonsela-Washpass family-Viewpoint complex, 20 to 70 percent slopes; San Juan County, New Mexico; Narbona Pass Quadrangle; lat. 36 degrees 04 minutes 01 seconds N. and long. 108 degrees 51 minutes 19 seconds W., NAD 27.

Oi—0 to 1 inches; pine needles.

A—1 to 3 inches; dark grayish brown (10YR 4/2) loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, very friable, moderately sticky and slightly plastic; many very fine and fine roots; 2 percent gravel; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.

Bt—3 to 12 inches; very dark grayish brown (10YR 3/2) loam, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, moderately sticky and moderately plastic; common very fine and fine roots; few faint clay films on faces of peds; 2 percent gravel; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.

R—12 inches; basalt bedrock.

Range in Characteristics

Particle-size control section: 15 to 35 percent clay

Depth to lithic contact: 10 to 20 inches to hard bedrock

Rock fragments: average of less than 35 percent coarse fragments

Reaction: moderately acid to slightly alkaline

Calcium carbonate equivalent: none

Gypsum: none

Salinity: EC of 0 to 2 dS/m

Sodicity: none

A horizon:

Hue: 5YR, 7.5YR to 10YR

Value: 3 to 6 dry, 2 to 4 moist

Chroma: 1 to 3, dry or moist

Texture: loam, fine sandy loam

Rock fragments: 0 to 35 percent cobbles and 0 to 35 percent stones

Bt horizon:

Hue: 5YR, 7.5YR to 10YR

Value: 3 to 6 dry, 3 or 4 moist

Chroma: 1 to 4, dry or moist

Texture: loam, clay loam, sandy loam, sandy clay loam

Rock fragments: 0 to 30 percent gravel; 0 to 35 percent cobbles

Vosburg Series

Depth class: very deep

Drainage class: well

Slowest permeability: 0.6 to 2.0 in/hr (moderate)

Geomorphic position: stable landslides

Parent material: slope alluvium derived from sandstone and shale

Elevation: 6,800 to 7,800 feet

Slope: 1 to 5 percent

Climatic data:

Mean annual precipitation: 14 to 18 inches

Mean annual air temperature: 48 to 51 degrees F
Frost-free period: 110 to 140 days

*Taxonomic class:* Fine-loamy, mixed, superactive, mesic Pachic Argiustolls

**Typical Pedon**

Vosburg loam in an area of mapping unit Iwela family-Nomrah-Vosburg complex, 1 to 40 percent slopes; McKinley County, New Mexico; Chuska Peak Quadrangle; lat. 35 degrees 53 minutes 56 seconds N. and long. 108 degrees 47 minutes 48 seconds W., NAD 27.

A—0 to 4 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; noneffervescent; neutral; abrupt smooth boundary.

BA—4 to 10 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; noneffervescent; slightly alkaline; abrupt smooth boundary.

Bt1—10 to 21 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak medium and fine subangular blocky; soft, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; few faint clay films on faces of peds; noneffervescent; slightly alkaline; abrupt smooth boundary.

Bt2—21 to 30 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few distinct clay films on faces of peds; noneffervescent; slightly alkaline; clear smooth boundary.

BC—30 to 42 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; noneffervescent; slightly alkaline; abrupt smooth boundary.

Bk—42 to 65 inches; dark gray (10YR 4/1) fine sandy loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine soft calcium carbonate masses; slightly alkaline; strongly effervescent.

**Range in Characteristics**

Particle-size control section: 18 to 35 percent clay
Rock fragments: 0 to 5 percent
Reaction: slightly acid to slightly alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: none
Salinity: EC of 0 to 1 dS/m
Sodicity: none

A and BA horizons:

Hue: 7.5YR, 10YR
Value: 3 to 5 dry, 2 or 3 moist
Chroma: 2 or 3, dry or moist
Texture: loam, fine sandy loam

Bt horizons:

Hue: 7.5YR, 10YR
Value: 3 to 5 dry, 2 to 4 moist
Chroma: 2 to 4, dry or moist
Texture: clay loam, sandy clay loam

Btk, BC, or Bk horizons:

Hue: 5YR, 7.5YR, 10YR
Washpass family

Depth class: very deep
Drainage class: well
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: summits of plateaus
Parent material: colluvium derived from basalt and tuff-breccia
Elevation: 8,200 to 9,800 feet
Slope: 25 to 70 percent
Climatic data:
  Mean annual precipitation: 18 to 22 inches
  Mean annual air temperature: 40 to 43 degrees F
  Frost-free period: 80 to 110 days
Taxonomic class: Coarse-loamy, mixed, superactive Ustic Argicryolls

Typical Pedon

Washpass family in an area of mapping unit Sonsela-Washpass family-Viewpoint complex, 20 to 70 percent slopes; San Juan County, New Mexico; lat. 36 degrees 05 minutes 03 seconds N. and long. 108 degrees 51 minutes 38 seconds W., NAD 27.

A—0 to 2 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; 2 percent gravel; noneffervescent; slightly alkaline (pH 7.4); abrupt smooth boundary.

Bt1—2 to 15 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak very fine and fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; few faint clay films on faces of peds; noneffervescent; slightly alkaline (pH 7.4); clear smooth boundary.

Bt2—15 to 23 inches; dark yellow brown (10YR 4/4) loam, dark brown (10YR 3/4) moist; weak very fine, fine, and medium subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; common very fine roots; few faint clay films on faces of peds; 2 percent gravel; noneffervescent; slightly alkaline (pH 7.4); clear smooth boundary.

Bt3—23 to 40 inches; brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 3/4) moist; weak very fine and fine subangular blocky structure; soft, friable, moderately sticky and moderately plastic; few very fine roots; few distinct clay films on faces of peds; 3 percent gravel; noneffervescent; slightly alkaline (pH 7.4); clear smooth boundary.

Bt4—40 to 60 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; moderate medium and coarse subangular blocky structure; slightly hard, firm, moderately sticky and moderately plastic; few very fine roots; few distinct clay films on faces of peds; 5 percent gravel and 3 percent cobbles; noneffervescent; slightly alkaline (pH 7.6).

Range in Characteristics

Particle-size control section: 10 to 18 percent
Rock fragments: average of 10 to 35 percent
Depth to base of argillic horizon: 60 inches or more
Reaction: moderately acid to neutral
Calcium carbonate equivalent: none
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none
A horizon:
  Value: 3 or 4 dry, 2 or 3 moist
  Chroma: 2 or 3, dry or moist
  Rock fragments: average of 0 to 15 percent; 0 to 10 percent gravel, 0 to 5 percent cobbles, 1 to 3 percent stones

BA horizon (when present):
  Value: 3 to 5 dry, 2 or 3 moist
  Chroma: 2 or 3, dry or moist
  Rock fragments: average of 0 to 15 percent; 0 to 10 percent gravel, 0 to 5 percent cobbles, 0 to 3 percent stones

Bt/E horizons (when present):
  Hue: 7.5YR, 10YR
  Value: 4 or 5 dry, 3 or 4 moist
  Chroma: 2 to 4, dry or moist
  Texture: fine sandy loam, sandy loam
  Rock fragments: average of 10 to 35 percent; 10 to 20 percent gravel, 0 to 10 percent cobbles, 0 to 5 percent stones

Bt horizons:
  Hue: 7.5YR, 10YR
  Value: 5 or 6 dry, 3 to 5 moist
  Chroma: 2 to 4, dry or moist
  Texture: fine sandy loam, sandy loam
  Rock fragments: average of 35 to 60 percent; 30 to 40 percent gravel, 5 to 15 percent cobbles, 0 to 5 percent stones

Wenota Series

Depth class: very deep
Drainage class: well
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Geomorphic position: flood plains
Parent material: stream alluvium derived from shale
Elevation: 5,800 to 7,200 feet
Slope: 1 to 3 percent
Climatic data:
  Mean annual precipitation: 10 to 14 inches
  Mean annual air temperature: 50 to 53 degrees F
  Frost-free period: 120 to 150 days
Taxonomic class: Fine, mixed, superactive, calcareous, mesic Ustic Torrifluvents

Typical Pedon

Wenota clay in an area of mapping unit San Mateo-Wenota-Radnik complex, 0 to 3 percent slopes; Navajo County, Arizona; Cornfields Quadrangle; lat. 35 degrees 42 minutes 08 seconds N. and long. 109 degrees 38 minutes 30 seconds W., NAD 27.
A—0 to 5 inches; reddish brown (5YR 5/4) clay, reddish brown (2.5YR 4/4) moist; strong medium angular blocky structure; hard, firm, moderately sticky and moderately plastic; many very fine roots; many very fine dendritic tubular pores; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.
C1—5 to 20 inches; reddish brown (5YR 5/4) clay, reddish brown (2.5YR 4/4) moist; moderate medium angular blocky structure; hard, firm, moderately sticky and slightly plastic; common very fine, very few medium and few fine roots; very few very fine dendritic tubular pores; violently effervescent; moderately alkaline (pH 8.2); gradual smooth boundary.

C2—20 to 40 inches; reddish brown (5YR 5/4) clay, reddish brown (2.5YR 4/4) moist; massive; hard, firm, very sticky and very plastic; common very fine roots; very few very fine dendritic tubular pores; violently effervescent; moderately alkaline (pH 8.2); gradual smooth boundary.

C3—40 to 80 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; massive; hard, firm, moderately sticky and moderately plastic; violently effervescent; moderately alkaline (pH 8.2).

**Range in Characteristics**

Particle-size control section: 35 to 50 percent clay
Rock fragments: 0 to 5 percent
Reaction: moderately alkaline
Calcium carbonate equivalent: 0 to 5 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
- Hue: 10YR, 5YR
- Value: 5 or 6 dry
- Chroma: 3 or 4, dry or moist
- Texture: clay, clay loam

C horizon:
- Hue: 2.5YR, 5YR, 7.5YR, 10YR
- Chroma: 3 or 4, dry or moist
- Texture: clay, clay loam, sandy clay loam, sandy loam
- Other features: thin strata of fine sand are common.

**Wepo Series**

*Depth class:* very deep
*Drainage class:* well
*Slowest permeability:* 0.06 to 0.2 in/hr (slow)
*Geomorphic position:* stream terraces on valley floors
*Parent material:* stream alluvium derived from shale
*Elevation:* 5,100 to 6,200 feet
*Slope:* 1 to 3 percent
*Climatic data:*
- Mean annual precipitation: 6 to 10 inches
- Mean annual air temperature: 51 to 54 degrees F
- Frost-free period: 130 to 160 days
*Taxonomic class:* Fine, mixed, superactive, mesic Vertic Haplocambids

**Typical Pedon**

Wepo clay in an area of mapping unit Wepo-Ives-Jocity association, 0 to 2 percent slopes; Navajo County, Arizona; Satan Butte Quadrangle; lat. 35 degrees 32 minutes 24 seconds N. and long. 109 degrees 53 minutes 27 seconds W., NAD 27.
A—0 to 3 inches; brown (7.5YR 5/3) clay, brown (7.5YR 5/2) moist; strong medium granular structure; slightly hard, very friable, very sticky and very plastic; calcium carbonate masses dispersed throughout; slightly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bw1—3 to 8 inches; brown (7.5YR 5/3) clay, brown (7.5YR 5/2) moist; strong very coarse prismatic structure parting to moderate medium subangular blocky; hard, firm, moderately sticky and very plastic; many very fine roots; very few very fine dendritic tubular pores; calcium carbonate masses dispersed throughout; few clay films on ped faces; slightly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Bw2—8 to 14 inches; brown (7.5YR 5/3) clay, brown (7.5YR 4/3) moist; strong very coarse prismatic structure parting to strong coarse angular blocky; hard, firm, moderately sticky and very plastic; common very fine roots; common very fine dendritic tubular pores; calcium carbonate masses dispersed throughout; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Bw3—14 to 35 inches; brown (7.5YR 5/3) silty clay, brown (7.5YR 4/3) moist; moderate medium angular blocky structure; moderately hard, friable, moderately sticky and moderately plastic; common very fine roots; common very fine dendritic tubular pores; calcium carbonate masses dispersed throughout; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Bk—35 to 45 inches; light brown (7.5YR 6/3) loam, brown (7.5YR 4/3) moist; massive; moderately hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine and fine dendritic tubular pores; few fine masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.4); abrupt smooth boundary.

2C1—45 to 51 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine dendritic tubular pores; few fine masses of calcium carbonate; strongly effervescent; moderately alkaline (pH 8.4); abrupt smooth boundary.

2C2—51 to 59 inches; pink (7.5YR 7/3) sandy clay loam, brown (7.5YR 5/3) moist; massive; slightly hard, very friable, slightly sticky and moderately plastic; calcium carbonate masses dispersed throughout; strong effervescent; strongly alkaline (pH 8.6); clear smooth boundary.

2C3—59 to 68 inches; very pale brown (10YR 7/3) sandy loam, grayish brown (10YR 5/2) moist; massive; soft, very friable, nonsticky and nonplastic; strongly effervescent; strongly alkaline (pH 8.6); clear smooth boundary.

2C4—68 to 80 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; slightly effervescent; strongly alkaline (pH 8.6).

**Range in Characteristics**

Particle-size control section: 25 to 55 percent clay
Rock fragments: 0 to 5 percent
Reaction: slightly to strongly alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: 0 to 2 percent
Salinity: EC of 0 to 2 dS/m
Sodicity: SAR of 0 to 2
COLE: more than 0.05 in A and B horizons

A horizon:

- Hue: 5YR, 7.5YR, 10YR
- Value: 5 or 6 dry, 4 or 5 moist
- Chroma: 2 to 4, dry or moist
- Texture: clay loam, silty clay loam, silty loam, loam, sandy clay loam, loamy fine sand, clay
B horizon:
  Hue: 5YR, 7.5YR, 10YR
  Value: 5 or 6 dry, 3 to 5 moist
  Chroma: 2 to 4, dry or moist
  Texture: clay loam, silty clay, loam, clay; with thin strata of coarser textured material

C horizon:
  Hue: 5YR, 7.5YR, 10YR
  Value: 5 or 6 dry, 4 or 5 moist
  Chroma: 2 to 4, dry or moist
  Texture: sandy loam, sandy clay loam, very fine sandy loam, loamy sand, stratified clay and sand

Werito Series

Depth class: moderately deep
Drainage class: well
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Geomorphic position: plateaus
Parent material: alluvium over residuum derived from shale
Elevation: 5,400 to 6,000 feet
Slope: 1 to 3 percent
Climatic data:
  Mean annual precipitation: 6 to 10 inches
  Mean annual air temperature: 51 to 54 degrees F
  Frost-free period: 130 to 160 days
Taxonomic class: Fine, mixed, active, mesic Sodic Haplocambids

Typical Pedon

Werito loam in an area of mapping unit Werito loam, 1 to 3 percent slopes; San Juan County, New Mexico; in the Soil Survey of Shiprock Area, Arizona and New Mexico; about 5 miles northeast of Sheep Springs, 2,425 feet west and 3,275 feet south of the northeast corner of sec. 2, T. 22 N., R. 17 W.; lat. 36 degrees 10 minutes 3 seconds N. and long. 108 degrees 37 minutes 14 seconds W., NAD 27.

A—0 to 3 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; moderate thick platy structure parting to moderate very fine granular; soft, very friable, slightly sticky and slightly plastic; few fine and very fine roots; 5 percent fine gravel and 5 percent small channers; strongly effervescent; moderately alkaline; clear smooth boundary.

Bn1—3 to 7 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak coarse and moderate medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few medium and fine and common very fine roots; few very fine tubular pores; 5 percent gravel; strongly effervescent; strongly alkaline; clear smooth boundary.

Bn2—7 to 14 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak coarse and medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common fine roots; few fine tubular pores; 5 percent channers; strongly effervescent, secondary calcium carbonate segregated as very few fine irregularly shaped accumulations on faces of peds; strongly alkaline; clear smooth boundary.

Bkn—14 to 17 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few medium and common fine and very fine roots; few very
fine tubular pores; 10 percent soft shale fragments; 5 percent channers; strongly
effervescent, secondary calcium carbonates segregated in few fine and medium,
irregularly shaped masses and filaments; moderately alkaline; clear smooth
boundary.

2By—17 to 22 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown
(10YR 3/2) moist; moderate coarse subangular blocky structure; slightly hard, friable,
moderately sticky and moderately plastic; few fine and common very fine roots; 20
percent soft shale fragments; 5 percent channers and 5 percent gravel; secondary
silt-sized gypsum crystals segregated in common fine and medium irregularly shaped
seams and on rock fragments; slightly alkaline; clear wavy boundary.

2C—22 to 34 inches; brown (7.5YR 5/2) silty clay, brown (7.5YR 5/2) moist;
massive, platy rock structure; hard, firm, moderately sticky and moderately plastic;
few fine and very fine roots; 80 percent soft shale fragments; extremely acid; clear
irregular boundary.

2Cr—34 inches; shale bedrock.

Range in Characteristics

Particle-size control section: 35 to 55 percent clay
Depth to paralithic contact: 20 to 40 inches to shale
Rock fragments: 0 to 15 percent
Reaction: extremely acid to strongly alkaline
Calcium carbonate equivalent: 5 to 15 percent
Gypsum: 5 to 15 percent
Salinity: EC of 0 to 4 dS/m
Sodicity: SAR of 0 to 30

A horizon:
  Value: 2 to 6 dry
  Chroma: 1 to 4
  Texture: clay, clay loam, sandy clay loam, fine sandy loam

Bn and Bkn horizons:
  Other features: 0 to 15 percent soft shale fragments

By and C horizon:
  Value: 3 to 6 dry, 2 to 5 moist
  Chroma: 1 to 4, dry or moist
  Texture: clay loam, loam, silt clay loam, sandy clay loam, clay
  Other features: 15 to 95 percent soft shale fragments

Whitecone Series

Depth class: deep
Drainage class: well
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Geomorphic position: footslopes of plateaus
Parent material: fan alluvium derived from shale
Elevation: 5,800 to 6,200 feet
Slope: 1 to 3 percent
Climatic data:
  Mean annual precipitation: 6 to 10 inches
  Mean annual air temperature: 51 to 54 degrees F
  Frost-free period: 130 to 160 days
Taxonomic class: Fine, mixed, active, mesic Typic Natrargids
Typical Pedon

Whitecone clay loam in an area of mapping unit Redlands-Whitecone complex, 1 to 3 percent slopes, eroded; Navajo County, Arizona; about 2.5 miles west/northwest of Satan Butte; lat. 35 degrees 33 minutes 26 seconds N. and long. 109 degrees 58 minutes 8 seconds W.

A—0 to 1 inch; pale brown (10YR 6/3) clay loam; brown (10YR 4/3) moist; moderate fine prismatic structure parting to moderate very fine subangular blocky; hard, friable, moderately sticky and moderately plastic; strongly effervescent; strongly alkaline (pH 8.7); abrupt smooth boundary.

Btn1—1 to 4 inches; brown (10YR 5/3) clay; brown (10YR 5/3) moist; moderate fine angular blocky structure; very hard, friable, very sticky and very plastic; few very fine roots; few very fine tubular pores; few distinct clay films on faces of peds; strongly alkaline (pH 8.9); clear smooth boundary.

Btn2—4 to 10 inches; brown (10YR 5/3) clay; brown (10YR 5/3) moist; moderate fine angular blocky structure; very hard, friable, very sticky and very plastic; few very fine roots; few fine tubular pores; few distinct clay films on faces of peds and lining pores; strongly effervescent; strongly alkaline (pH 8.9); clear smooth boundary.

Btn3—10 to 19 inches; brown (10YR 5/3) clay; brown (10YR 5/3) moist; moderate fine angular blocky structure; very hard, friable, very sticky and very plastic; few very fine roots; few fine tubular pores; few distinct clay films on faces of peds and lining root channels and/or pores; strongly effervescent; strongly alkaline (pH 8.6); clear smooth boundary.

Btn4—19 to 28 inches; brown (10YR 5/3) clay loam; brown (10YR 4/3) moist; moderate fine angular blocky structure; very hard, friable, very sticky and very plastic; few very fine roots; few very fine tubular pores; few distinct clay films on faces of peds and lining root channels and/or pores; strongly effervescent; strongly alkaline (pH 8.6); abrupt smooth boundary.

Btn5—28 to 39 inches; pale brown (10YR 6/3) clay loam; brown (10YR 4/3) moist; moderate medium subangular blocky structure; very hard, friable, very sticky and very plastic; few very fine roots; common fine tubular pores; few faint clay films on faces of peds; strongly effervescent; moderately alkaline (pH 8.4); clear smooth boundary.

Btn6—39 to 54 inches; pale brown (10YR 6/3) clay loam; brown (10YR 4/3) moist; moderate medium subangular blocky structure; very hard, friable, very sticky and very plastic; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.

Cr—54 inches; soft shale bedrock.

Range in Characteristics

Particle-size control section: 35 to 50 percent clay
Depth to paralithic contact: 50 to 60 inches to shale
Calcium carbonate equivalent: 0 to 5 percent
Salinity: EC of 0 to 8 dS/m
Sodicity: SAR of 5 to 30
Reaction: moderately or strongly alkaline

A horizon:
  Hue: 7.5Yr or 10YR
  Value: 5 or 6 dry, 4 or 5 moist
  Chroma: 3 or 4, dry or moist

Btn horizons:
  Value: 4 to 7 dry, 4 to 6 moist
  Chroma: 3 or 4 or 6, dry or moist
  Texture: clay, sandy clay loam, clay loam
Yahmore family

Depth class: very deep
Drainage class: well
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: summits of plateaus
Parent material: slope alluvium derived from sandstone, shale, and basalt
Elevation: 7,400 to 8,400 feet
Slope: 1 to 15 percent
Climatic data:
  Mean annual precipitation: 18 to 22 inches
  Mean annual air temperature: 40 to 43 degrees F
  Frost-free period: 80 to 110 days
Taxonomic class: Coarse-loamy, mixed, superactive, frigid Pachic Argiustolls

Typical Pedon

Yahmore family in an area of mapping unit Kunz-Yahmore family complex, 2 to 35 percent slopes; McKinley County, New Mexico; Chuska Peak Quadrangle; lat. 35 degrees 54 minutes 41 seconds N. and long. 108 degrees 48 minutes 38 seconds W., NAD 27.

A—0 to 1 inch; dark grayish brown (10YR 4/2) loamy sand, very dark grayish brown (10YR 3/2) moist; single grain; loose, nonsticky and nonplastic; many very fine roots; 3 percent cobbles, 3 percent gravel; noneffervescent; abrupt smooth boundary.

BA—1 to 12 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; 1 percent gravel; noneffervescent; clear smooth boundary.

Bt—12 to 28 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; many very fine roots; few faint clay films on faces of peds and bridging sand grains; 1 percent gravel; very slightly effervescent; abrupt smooth boundary.

Bk—28 to 60 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine soft calcium carbonate masses; 3 percent gravel; very slightly effervescent.

Range in Characteristics

Particle-size control section: 10 to 18 percent clay
Rock fragments: 0 to 10 percent
Reaction: slightly acid to moderately alkaline
Calcium carbonate equivalent: 0 to 1 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
  Hue: 7.5YR, 10YR
  Value: 4 to 6 dry
  Chroma: 2 to 4
  Texture: loamy fine sand, fine sandy loam, loam, loamy sand

Upper Bt horizons:
  Value: 4 to 6 dry, 3 or 4 moist
  Chroma: 2, 4 or 6, dry or moist
Texture: fine sandy loam, loam, sandy loam

Lower Bt horizons (when present):
- Hue: 5YR, 7.5YR, 10YR
- Value: 5 or 6 dry, 3 or 4 moist
- Chroma: 4 or 6, dry or moist
- Texture: sandy clay loam, loam

Other features: in some pedons, relict redox concentrations, soft shale fragments, or minor amounts of secondary calcium carbonates are in the lower part.

Zia Series

*Depth class:* very deep  
*Drainage class:* well  
*Slowest permeability:* 2.0 to 6.0 in/hr (moderately rapid)  
*Geomorphic position:* stream terraces on valley floors  
*Parent material:* eolian material and stream alluvium derived from sandstone  
*Elevation:* 5,900 to 7,000 feet  
*Slope:* 1 to 5 percent  
*Climatic data:*  
  - Mean annual precipitation: 10 to 14 inches  
  - Mean annual air temperature: 50 to 53 degrees F  
  - Frost-free period: 120 to 150 days  
*Taxonomic class:* Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torriorthents

**Typical Pedon**

Zia sandy loam in an area of mapping unit Zia sandy loam, 1 to 5 percent slopes; Apache County, Arizona; Cornfields Quadrangle; lat. 35 degrees 43 minutes 20 seconds N. and long. 109 degrees 42 minutes 12 seconds W., NAD 27.

A—0 to 2 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; noneffervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C1—2 to 8 inches; yellowish brown (10YR 5/4) fine sandy loam, brown (7.5YR 5/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; common very fine dendritic tubular pores; noneffervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

C2—8 to 22 inches; light brown (7.5YR 6/4) loamy sand, brown (7.5YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; few very fine dendritic tubular pores; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C3—22 to 34 inches; light brown (7.5YR 6/3) sandy loam, brown (7.5YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

C4—34 to 50 inches; pink (7.5YR 7/4) loamy sand, brown (7.5YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; strongly effervescent; strongly alkaline (pH 8.6); abrupt smooth boundary.

Ck—50 to 60 inches; very pale brown (10YR 7/4) loamy sand, light brown (7.5YR 6/4) moist; massive; soft, loose, nonsticky and nonplastic; few medium masses of calcium carbonate; 5 percent gravel; strongly effervescent; strongly alkaline (pH 8.6); abrupt smooth boundary.

C—60 to 80 inches; light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; strongly effervescent; strongly alkaline (pH 8.6).
Range in Characteristics

Particle-size control section: 8 to 18 percent clay
Rock fragments: 0 to 10 percent
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: none
Salinity: EC of 0 to 2 dS/m
Sodicity: none

A horizon:
  Hue: 5YR, 7.5YR, 10YR
  Value: 5 or 6 dry, 4 or 5 moist
  Chroma: 3 to 8, dry or moist
  Texture: fine sand, sand, fine sandy loam, loamy sand, sandy loam

Bw or C horizon:
  Hue: 5YR, 7.5YR, 10YR
  Value: 4 to 7 dry
  Chroma: 3 to 8, dry or moist
  Texture: fine sand, loamy fine sand, fine sandy loam, sandy clay loam, clay loam, sand, clay, sandy loam, loamy sand
  Other features: typically, the C horizon contains strata of loamy sand or sandy clay loam.

Zilditloi Series

Depth class: very deep
Drainage class: excessively
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Geomorphic position: summits of plateaus
Parent material: slope alluvium, colluvium, and residuum derived from sandstone
Elevation: 7,800 to 9,000 feet
Slope: 40 to 80 percent
Climatic data:
  Mean annual precipitation: 18 to 22 inches
  Mean annual air temperature: 40 to 43 degrees F
  Frost-free period: 80 to 110 days
Taxonomic class: Mixed, frigid Typic Ustipsamments

Typical Pedon

Zilditloi loamy fine sand in an area of mapping unit Zilditloi-Nakaibito complex, 40 to 80 percent slopes; McKinley County, New Mexico; Chuska Peak Quadrangle; lat. 35 degrees 59 minutes 34 seconds N. and long. 108 degrees 51 minutes 41 seconds W., NAD 27.
  A—0 to 4 inches; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; massive; loose, nonsticky and nonplastic; common very fine and fine roots; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.
  AC—4 to 8 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; massive; loose, nonsticky and nonplastic; common very fine and fine roots; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.
  C1—8 to 16 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; single grain; loose, nonsticky and nonplastic; few very fine and fine roots; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.
  C2—16 to 36 inches; very pale brown (10YR 7/3) sand, brown (10YR 5/3) moist;
single grain; loose, nonsticky and nonplastic; noneffervescent; neutral (pH 7.0); clear smooth boundary.

C3—36 to 60 inches; very pale brown (10YR 7/4) sand, yellowish brown (10YR 5/4) moist; single grain; loose, nonsticky and nonplastic; noneffervescent; neutral (pH 7.0).

**Range in Characteristics**

Particle-size control section: 2 to 8 percent  
Rock fragments: 0 to 10 percent  
Reaction: neutral or slightly alkaline  
Calcium carbonate equivalent: 0 to 1 percent  
Gypsum: none  
Salinity: EC of 0 to 2 dS/m  
Sodicity: none

A and AC horizons:  
- Hue: 5YR, 7.5YR, 10YR  
- Value: 5 or 6 dry, 3 to 5 moist  
- Chroma: 2 to 4, dry or moist  
- Texture: loamy sand, fine sandy loam, loamy fine sand

C horizon:  
- Hue: 5YR, 7.5YR, 10YR  
- Value: 5 to 8 dry, 4 to 7 moist  
- Chroma: 2 to 6, dry or moist  
- Texture: loamy sand, fine sand, sand, loamy fine sand

**Zyme Series**

*Depth class:* very shallow, shallow  
*Drainage class:* well  
*Slowest permeability:* 0.06 to 0.2 in/hr (slow)  
*Geomorphic position:* hills  
*Parent material:* alluvium and residuum derived from shale  
*Elevation:* 5,900 to 6,800  
*Slope:* 5 to 50 percent  
*Climatic data:*  
  - Mean annual precipitation: 10 to 14 inches  
  - Mean annual air temperature: 50 to 52 degrees F  
  - Frost-free period: 120 to 150 days  
*Taxonomic class:* Clayey, smectitic, calcareous, mesic, shallow Ustic Torriorthents

**Typical Pedon**

Zyme clay loam in an area of mapping unit Kydestea-Zyme-Tonalea complex, 5 to 50 percent slopes; on the John Daw Quadrangle; in the Soil Survey of Hopi Area, Arizona; about 8.0 miles west of Cottonwood Spring and 0.7 miles north of the Black Mesa pipeline, 500 feet east of the intersection of coordinates 4018 N. and 521 E.

A—0 to 1 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine granular structure; slightly hard, firm, moderately sticky and very plastic; few very fine roots; many very fine vesicular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bw1—1 to 4 inches; yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, very firm, very sticky
and very plastic; few very fine roots; few very fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bw₂—4 to 9 inches; brown (10 YR 5/3) clay, brown (10YR 4/3) moist; weak medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common very fine roots; few very fine tubular pores; slightly effervescent; moderately alkaline; gradual smooth boundary.

C—9 to 18 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; massive; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; about 20 percent soft shale fragments; fine soft lime accumulations; slightly alkaline; abrupt smooth boundary.

Cr₁—18 to 24 inches; shale; rocklike structure; few fine roots along seams; abrupt smooth boundary.

Cr₂—24 inches; shale; common gypsum crystals.

**Range in Characteristics**

- **Particle-size control section:** 35 to 55 percent clay
- **Depth to paralithic:** 6 to 20 inches
- **Reaction:** slightly or moderately alkaline
- **Calcium carbonate equivalent:** 1 to 10 percent
- **Gypsum:** 0 to 5 percent
- **Salinity:** EC of 0 to 2 dS/m
- **Sodicity:** none

- **Bw horizons:**
  - **Chroma:** 3 or 4, dry or moist
  - **Texture:** clay, clay loam

- **C horizons:**
  - **Texture:** clay, clay loam,
  - **Other features:** 0 to 20 percent soft shale fragments
Formation of the Soils

Soil is a natural, three-dimensional body on the surface of the earth that supports plants. Although the soil mantle on the earth’s surface varies widely in many places, all soils consist of minerals, organic matter, living organisms, water, and air. These components occur in varying amounts in different soils.

Soil results from the action of soil-forming processes on materials deposited or accumulated by geological processes. The characteristics of the soil at any given point are determined by five factors: (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material accumulated and has existed since accumulation, (3) the plant and animal life on and in the soil, (4) the topography, or lay of the land, and (5) the length of time that the forces of soil formation have acted on the parent material (Jenny, 1980). These factors of soil formation are independent, and few generalizations can be made regarding any one factor unless the effects of the others are known (Gile, 1965).

Parent Material

Parent material is the unconsolidated material in which the soil forms. It may have weathered in place from rock or it may have been transported by water, wind, or ice. The parent material of the soils in the survey area was derived from several sources and types of bedrock. Parent material can be put into six general groups: residuum, colluvium, slope alluvium, fan alluvium, stream alluvium, and eolian sand. Soils can form from a single parent material or a combination of parent materials.

Residuum is unconsolidated, weathered, or partly weathered mineral material that accumulated by the disintegration of bedrock in place.

Colluvium is unconsolidated earth materials deposited on and at the base of moderately steep and steep slopes by mass wasting (direct gravitational action) and local runoff.

Alluvium is unconsolidated material that has been deposited by running water. It includes gravel, sand, silt, and clay, alone and in various mixtures. Slope alluvium is moved from steep slopes to more gentle slopes. Fan alluvium is moved along alluvial fans. Stream alluvium is deposited by streams. Alluvial parent material can come from more than one source.

Eolian parent material pertains to material transported and deposited by the wind. It results in dune formations.

Climate

Climate is a major factor of soil formation. Temperature, precipitation, humidity, and wind affect vegetation (biological activity), parent material, and soil drainage. These factors affect the accumulation of organic matter, leaching of salts, the type and rate of weathering of the soil mineral constituents, and the development of diagnostic soil features.
Plant and Animal Life

The effects of plants, animals, and humans are important in soil formation. Where the temperature is suitable for their growth, plants begin to grow as soon as they receive suitable amounts of water and nutrients. Plants, including fungi, influence soil formation by returning residues to the soil and aiding in decomposition. Plants influence the temperature of the soil by providing shade during warm periods and by helping to reduce evaporation from the soil surface. Vegetation also affects the transfer of minerals within the soil, the soil pH, and, in conjunction with climate and topography, the movement of material by leaching.

Bacteria, nematodes, and other forms of animal life aid in the weathering of minerals and the decomposition of organic matter. The larger animals, such as ants, earthworms, gophers, skunks, and reptiles, alter the soil by turning and mixing it during burrowing activities.

Humans can have a strong influence on soil formation. Tillage and overgrazing may accelerate erosion. Changes in drainage conditions or topography induced by land shaping also influence the soil. Modifications in natural fertility by fertilizers, incorporation of organic residues, or cropping practices can also alter the soil-forming process.

As a rule, humans, plants, animals, insects, bacteria, and fungi affect the formation of soils by increasing the content of organic matter, producing gains or losses in plant nutrients, mixing soil layers, and changing structure and porosity.

Topography

Topography and runoff influence the formation of soils by affecting drainage, erosion, soil temperature, and plant cover. The thickness and kind of soil horizons depend on the amount of water that percolates through the parent material. Normally, more water enters a soil that is nearly level or gently sloping than one that is strongly sloping or steep.

The amount of runoff depends on the slope. Steeper slopes have a higher amount of runoff than do gentle slopes. Coarse-textured soils take in water more rapidly than do fine-textured soils. Less water is lost through runoff on slopes that have coarse-textured soils than on those having fine-textured soils.

Aspect affects soil formation in the moderate to high elevations. Soils are slightly deeper on the north- and east-facing slopes because rainfall is more effective, temperatures are cooler, and plants are more numerous.

Time

The soils of the area range from very old to very young. The kind of horizons and the degree of soil formation depend in part on how long the soil has remained stable.

The youngest soils that show the least development are on flood plains and stream terraces. The parent material of these soils has been in place for only a short period.

Soils on fan terraces show greater development. Deposition of parent material still occurs on alluvial fans. Fan terraces are relict alluvial fans that have been dissected and no longer have active deposition of parent material. Argillic horizons have developed, and calcium carbonate is accumulating. The older soils in this group are generally higher in clay and redder in color.
The survey area is part of the Colorado Plateau physiographic province, which is generally characterized by rough, broken terrain, including small, steep mountainous areas, plateaus, cuestas, and mesas intermingled with steep canyon walls, escarpments, and valleys.

The following are typical landforms recognized in the survey area. Landforms are not static; they are continually being created and eroded.

**Alluvial Fans**

Alluvial fans originate from erosional sediments derived from upslope landforms. Sediment loads are deposited when slope gradients change from upland positions to less sloping landforms. An inherent feature of fan development is the continuously changing pattern of channels and loci of deposition (Cooke 1973). Over a long period of time, these changes ensure the maintenance of the alluvial fans by continually distributing material widely over the surface. The soils on this landform are generally very deep, and their textures are highly variable, depending on the local geology of the source alluvium. Soil parent material is typically considered fan alluvium or alluvium.

**Dunes and Sand Sheets**

These landforms developed from Holocene-age and present-day eolian sands. Dunes and sand sheets in the context of landforms are not the same as Dune land. Dune land is considered a miscellaneous area and consists of sand in ridges and intervening troughs that shift with the wind. Dune land is almost always devoid of vegetation, or at the most it has pioneer species. Most dunes in the area have been stabilized by the establishment of vegetation that restricts dune activity. Relatively small transverse dunes form perpendicular to the prevailing winds, and longitudinal dunes form parallel to the prevailing wind. Dunes may be found as a component on other landforms described in this section. Soils on dune landforms can be very deep and located in large dune fields or they can occur as a shallow mantle over bedrock-controlled surfaces. Soil parent material is considered eolian material.

**Escarpments**

Escarpments are a familiar feature in the survey area. They are relatively steep slopes or cliffs produced by erosion and faulting. Because of the steepness of the slopes, the soils formed on this landform are generally shallow but can be very deep. Escarpments can be a landform component associated with plateaus, cuestas, or mesas. Soil parent material is typically considered colluvium, although slope alluvium and residuum may also occur.
Fan Terraces

Fan terraces are alluvial fans that have been dissected, or downcut, to the point at which flooding rarely occurs. Fan terraces have two important components: the summit, known as the tread, where erosional activity is relatively low; and the side slope, known as the riser, where erosion is cutting into the more stable summit. In most areas of the survey, the surface of the summit has a thick eolian mantle that is being eroded. Soils can exhibit different degrees of development, or pedogenesis, on these landforms. The expression of soil development depends upon the stability of the landform surface. More stable surfaces have more development; less stable or erosional surfaces have less development. Landform stability and the expression of soil development are somewhat directly proportional to the amounts, or expression, of illuviated silicate clay and/or translocated calcium carbonates. Soils on fan terraces can vary greatly in their physical and chemical properties. Soil parent material is considered alluvium or sometimes fan alluvium.

Flood Plains

This landform is formed by early Holocene-age to present-day stream alluvium. In this survey area, floodwaters flow at low to very low gradients along valley floors and are elongated. The soils on these flood plains receive periodic depositions of fresh alluvium, causing an irregular decrease in organic carbon and weak to no soil development. Soils on this landform are predominantly very deep, and their chemical and physical properties are highly variable, depending on the local geology of the source alluvium. Soil parent material is considered alluvium.

Mesas and Cuestas

These landforms have two important components: the mesa summit and the cuesta dipslope; and the escarpment. The summit and dipslope are both nearly level to gently sloping, bedrock-controlled surfaces that are generally stable. The soils are typically well developed and characterized by well expressed argillic horizons. The escarpment, where erosional activity is cutting back into the more stable summit, has little or no horizon development. Mesas differ from cuestas in that an escarpment terminates the mesa summit on all sides, whereas a cuesta will generally have one or more sides that grade into the surrounding terrain along gentle slopes. Soil parent material is generally residuum on the summit position and colluvium or slope alluvium on the escarpments.

Plateaus

Plateaus are large, comparatively flat areas. Specifically, a plateau is an extensive land region that is considerably elevated above 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. Many other landforms can exist on plateaus. Soil parent material is highly variable depending on whether other landforms exist on the plateau; however, soils on the plateau landform itself typically formed in parent material that derived from residuum or slope alluvium.

Stream Terraces

This position is the erosional remnant of the active flood plain that existed during the late Pleistocene to Holocene ages. The surface slopes in the same general
direction as the flood plain. Soils on stream terraces have typically been stable for a sufficient period of time to form cambic horizons. A cambic horizon is characterized by formation of soil structure and the illuvial concentration of calcium carbonate and sometimes gypsum. Stream terraces may be subject to rare or very rare flooding during unusual weather events. These occurrences and the thin alluvial deposits from the floodwaters do not inhibit soil development. The soils in this position are underlain by stratified sandy, gravelly, loamy, silty, or clayey sediments, and in some cases by buried paleosols. The parent material is considered alluvium.
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Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the “National Soil Survey Handbook” (available in local offices of the Natural Resources Conservation Service or on the Internet).

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.

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.

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.

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 hillsiide dominated by colluvium and slope-wash sediments (for example, slope alluvium).

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**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; an ecological site typified by such a landscape.

**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.

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

**Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

**Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

**Channery soil 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.

**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.

**Climax plant community.** The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

**Coarse textured soil.** Sand or loamy sand.

**Cobble (or cobblestone).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

**Cobbly soil material.** Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

**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, 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.
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.

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.”

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.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

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.

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.

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

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.

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.

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. Endoaquolls exhibit endosaturation.
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.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep. 

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.

Escarptment. 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.

Fan terrace. 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.

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

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.

Fluvial. Of or pertaining to rivers or streams; produced by stream or river action.

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).

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.

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

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.

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.

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.

**Iilluviation.** 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.

**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.

**Iron depletions.** See Redoximorphic features.

**Irrigation.** Application of water to soils to assist in production of crops.

**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.

**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 \(\frac{1}{3}\)- or \(\frac{1}{10}\)-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. **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. **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. **Mineral soil.** Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil. **Miscellaneous area.** A kind of map unit that has little or no natural soil and supports little or no vegetation. **Moderately coarse textured soil.** Coarse sandy loam, sandy loam, or fine sandy loam. **Moderately fine textured soil.** Clay loam, sandy clay loam, or silt 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. **Muck.** Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.) **Mudstone.** A blocky or massive, fine grained sedimentary rock in which the
proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

**Munsell notation.** A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

**Natric horizon.** A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

**Neutral soil.** A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

**Nodules.** See Redoximorphic features.

**Organic matter.** Plant and animal residue in the soil in various stages of decomposition.

**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.

**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.

**Ponding.** Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

**Pore linings.** See Redoximorphic features.

**Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.

**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.

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.

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, step-like landforms, such as successive stream terraces.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (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.

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.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

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.

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; 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.

Slickensides (pedogenic). Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope 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 Ca²⁺ + Mg²⁺. 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:

<table>
<thead>
<tr>
<th>Size</th>
<th>Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very coarse sand</td>
<td>2.0 to 1.0</td>
</tr>
<tr>
<td>Coarse sand</td>
<td>1.0 to 0.5</td>
</tr>
<tr>
<td>Medium sand</td>
<td>0.5 to 0.25</td>
</tr>
<tr>
<td>Fine sand</td>
<td>0.25 to 0.10</td>
</tr>
<tr>
<td>Very fine sand</td>
<td>0.10 to 0.05</td>
</tr>
<tr>
<td>Silt</td>
<td>0.05 to 0.002</td>
</tr>
<tr>
<td>Clay</td>
<td>less than 0.002</td>
</tr>
</tbody>
</table>

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 cobblesized 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.

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.

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).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope. 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** (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.

**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.”

**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.

**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.

**Tuff.** A generic term for any consolidated or cemented deposit that is 50 percent or
more volcanic ash.

**Upland.** An informal, general term for the higher ground of a region, in contrast with a
low-lying adjacent area, such as a valley or plain, or for land at a higher elevation
than the flood plain or low stream terrace; land above the footslope zone of the
hillslope continuum.

**Valley fill.** The unconsolidated sediment deposited by any agent (water, wind, ice, or
mass wasting) so as to fill or partly fill a valley.

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

**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.

**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.
Tables
### Table 1.--Temperature and Precipitation

(Recorded in the period 1971-2000 at Chaco Canyon National Monument, NM1647)

<table>
<thead>
<tr>
<th>Month</th>
<th>Average daily maximum (°F)</th>
<th>Average daily minimum (°F)</th>
<th>2 years in 10 will have-- higher than--</th>
<th>Average number of growing degree days*</th>
<th>Average number of days with snowfall 0.10 inch or more</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>42.9</td>
<td>12.9</td>
<td>27.9</td>
<td>62</td>
<td>-16</td>
</tr>
<tr>
<td>February</td>
<td>49.2</td>
<td>18.9</td>
<td>34.0</td>
<td>66</td>
<td>-7</td>
</tr>
<tr>
<td>March</td>
<td>57.9</td>
<td>23.4</td>
<td>40.7</td>
<td>75</td>
<td>3</td>
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<tr>
<td>April</td>
<td>66.4</td>
<td>28.9</td>
<td>47.7</td>
<td>82</td>
<td>10</td>
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<tr>
<td>May</td>
<td>75.9</td>
<td>37.8</td>
<td>56.9</td>
<td>89</td>
<td>19</td>
</tr>
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</table>

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<tr>
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<th>Average daily maximum (°F)</th>
<th>Average daily minimum (°F)</th>
<th>2 years in 10 will have-- higher than--</th>
<th>Average number of growing degree days*</th>
<th>Average number of days with snowfall 0.10 inch or more</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
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<td>49.6</td>
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</tr>
<tr>
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<td>Extreme</td>
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<td>-100</td>
<td>-22</td>
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Temperature and Precipitation

<table>
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<th>Temperature</th>
<th>Precipitation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Units</td>
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<td>In</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In</td>
</tr>
<tr>
<td>January</td>
<td>42.9</td>
<td>66.9</td>
</tr>
<tr>
<td>February</td>
<td>49.2</td>
<td>32.3</td>
</tr>
<tr>
<td>March</td>
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<td>32.3</td>
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<td>49.6</td>
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<td>49.6</td>
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<td>32.3</td>
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<tr>
<td>November</td>
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<td>32.3</td>
</tr>
<tr>
<td>December</td>
<td>43.9</td>
<td>32.3</td>
</tr>
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Temperature and Precipitation

<table>
<thead>
<tr>
<th>Month</th>
<th>Temperature</th>
<th>Precipitation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Units</td>
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<td></td>
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<td>In</td>
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<tr>
<td></td>
<td></td>
<td>In</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In</td>
</tr>
<tr>
<td>January</td>
<td>42.9</td>
<td>66.9</td>
</tr>
<tr>
<td>February</td>
<td>49.2</td>
<td>32.3</td>
</tr>
<tr>
<td>March</td>
<td>57.9</td>
<td>49.6</td>
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<td>49.6</td>
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<tr>
<td>June</td>
<td>86.4</td>
<td>32.3</td>
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<td>July</td>
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<td>49.6</td>
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<tr>
<td>August</td>
<td>87.0</td>
<td>32.3</td>
</tr>
<tr>
<td>September</td>
<td>80.2</td>
<td>49.6</td>
</tr>
<tr>
<td>October</td>
<td>68.7</td>
<td>32.3</td>
</tr>
<tr>
<td>November</td>
<td>53.8</td>
<td>32.3</td>
</tr>
<tr>
<td>December</td>
<td>43.9</td>
<td>32.3</td>
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</tbody>
</table>
Table 1.--Temperature and Precipitation--continued
(Recorded in the period 1971-2000 at Gallup FAA AP, NM3422)

<table>
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<th>Precipitation</th>
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<td>Average</td>
<td>Minimum</td>
</tr>
<tr>
<td></td>
<td>daily</td>
<td>daily</td>
</tr>
<tr>
<td></td>
<td>maximum</td>
<td>minimum</td>
</tr>
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<td>January----</td>
<td>44.2</td>
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</tr>
<tr>
<td>February---</td>
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<td>November---</td>
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<tr>
<td>December--</td>
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<td>13.0</td>
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<td>Yearly:</td>
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</tr>
<tr>
<td></td>
<td>Extreme----</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Total------</td>
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Table 1.--Temperature and Precipitation--continued
(Recorded in the period 1971-2000 at Otis, NM6465)

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<th>Precipitation</th>
</tr>
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<td>Average daily maximum</td>
<td>Average daily minimum</td>
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<tr>
<td></td>
<td>°F</td>
<td>°F</td>
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<tr>
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<tr>
<td>February--</td>
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<td>23.2</td>
</tr>
<tr>
<td>March------</td>
<td>52.2</td>
<td>28.1</td>
</tr>
<tr>
<td>April------</td>
<td>60.9</td>
<td>33.5</td>
</tr>
<tr>
<td>May--------</td>
<td>70.7</td>
<td>42.1</td>
</tr>
<tr>
<td>June-------</td>
<td>81.8</td>
<td>52.1</td>
</tr>
<tr>
<td>July-------</td>
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<td>56.8</td>
</tr>
<tr>
<td>August-----</td>
<td>82.4</td>
<td>55.4</td>
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<tr>
<td>September-</td>
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<td>49.2</td>
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<tr>
<td>November--</td>
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<td>27.3</td>
</tr>
<tr>
<td>December--</td>
<td>39.8</td>
<td>20.3</td>
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<tr>
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<td>Average-----</td>
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<tr>
<td></td>
<td>Extreme-----</td>
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</tr>
<tr>
<td></td>
<td>Total-------</td>
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Note: 2 years in 10 will have-- and Average number of growing degree days* are calculated as described in the text.
Table 1.--Temperature and Precipitation--continued

(Recorded in the period 1971-2000 at Window Rock 4 SW, AZ9410)

<table>
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<th>Precipitation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>Average</td>
</tr>
<tr>
<td></td>
<td>daily</td>
<td>daily</td>
</tr>
<tr>
<td></td>
<td>maximum</td>
<td>minimum</td>
</tr>
<tr>
<td>January---</td>
<td>43.0</td>
<td>15.1</td>
</tr>
<tr>
<td>February---</td>
<td>47.2</td>
<td>19.6</td>
</tr>
<tr>
<td>March------</td>
<td>53.3</td>
<td>24.9</td>
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<tr>
<td>April------</td>
<td>62.2</td>
<td>30.1</td>
</tr>
<tr>
<td>May--------</td>
<td>70.9</td>
<td>38.4</td>
</tr>
<tr>
<td>June-------</td>
<td>81.6</td>
<td>47.8</td>
</tr>
<tr>
<td>July-------</td>
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<td>54.5</td>
</tr>
<tr>
<td>August-----</td>
<td>82.3</td>
<td>52.9</td>
</tr>
<tr>
<td>September--</td>
<td>76.0</td>
<td>44.4</td>
</tr>
<tr>
<td>October-----</td>
<td>65.4</td>
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<td>November----</td>
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<td>23.6</td>
</tr>
<tr>
<td>December----</td>
<td>43.9</td>
<td>16.1</td>
</tr>
</tbody>
</table>

Yearly:

| Average-- | 63.5 | 33.4 | 48.5 | --- | --- | --- | --- | --- | --- | --- | --- |
| Extreme--- | 99 | -24 | 96 | -15 | --- | --- | --- | --- | --- | --- | --- |
| Total------ | --- | --- | --- | --- | 4,192 | 11.50 | 7.81 | 13.78 | 28 | 16.1 |

* 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>
<thead>
<tr>
<th>Probability</th>
<th>Temperature</th>
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<tbody>
<tr>
<td></td>
<td>24°F or lower</td>
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<tr>
<td>Last freezing temperature in spring:</td>
<td></td>
</tr>
<tr>
<td>1 year in 10 later than--</td>
<td>May 24</td>
</tr>
<tr>
<td>2 years in 10 later than--</td>
<td>May 17</td>
</tr>
<tr>
<td>5 years in 10 later than--</td>
<td>May 5</td>
</tr>
<tr>
<td>First freezing temperature in fall:</td>
<td></td>
</tr>
<tr>
<td>1 year in 10 earlier than--</td>
<td>Sept. 24</td>
</tr>
<tr>
<td>2 years in 10 earlier than--</td>
<td>Sept. 29</td>
</tr>
<tr>
<td>5 years in 10 earlier than--</td>
<td>Oct. 9</td>
</tr>
<tr>
<td>Probability</td>
<td>Temperature</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>24 oF or lower</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Last freezing temperature in spring:</td>
<td></td>
</tr>
<tr>
<td>1 year in 10 later than--</td>
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</tr>
<tr>
<td>2 years in 10 later than--</td>
<td>May 19</td>
</tr>
<tr>
<td>5 years in 10 later than--</td>
<td>May 7</td>
</tr>
<tr>
<td>First freezing temperature in fall:</td>
<td></td>
</tr>
<tr>
<td>1 year in 10 earlier than--</td>
<td>Sept. 27</td>
</tr>
<tr>
<td>2 years in 10 earlier than--</td>
<td>Oct. 3</td>
</tr>
<tr>
<td>5 years in 10 earlier than--</td>
<td>Oct. 14</td>
</tr>
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</table>
Table 2.--Freeze Dates in Spring and Fall--Continued
(Recorded in the period 1971-2000 at Otis, NM6465)

<table>
<thead>
<tr>
<th>Probability</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24 oF or lower</td>
</tr>
<tr>
<td>Last freezing temperature in spring:</td>
<td></td>
</tr>
<tr>
<td>1 year in 10 later than--</td>
<td>May 9</td>
</tr>
<tr>
<td>2 years in 10 later than--</td>
<td>May 2</td>
</tr>
<tr>
<td>5 years in 10 later than--</td>
<td>April 17</td>
</tr>
<tr>
<td>First freezing temperature in fall:</td>
<td></td>
</tr>
<tr>
<td>1 year in 10 earlier than--</td>
<td>Oct. 17</td>
</tr>
<tr>
<td>2 years in 10 earlier than--</td>
<td>Oct. 22</td>
</tr>
<tr>
<td>5 years in 10 earlier than--</td>
<td>Oct. 31</td>
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</table>
## Table 2.--Freeze Dates in Spring and Fall--Continued

(Recorded in the period 1971-2000 at Window Rock 4 SW, AZ9410)

<table>
<thead>
<tr>
<th>Probability</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24 oF or lower</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Last freezing temperature in spring:</td>
<td></td>
</tr>
<tr>
<td>1 year in 10 later than--</td>
<td>May 13</td>
</tr>
<tr>
<td>2 years in 10 later than--</td>
<td>May 6</td>
</tr>
<tr>
<td>5 years in 10 later than--</td>
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</tr>
<tr>
<td>First freezing temperature in fall:</td>
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<tr>
<td>1 year in 10 earlier than--</td>
<td>Sept. 30</td>
</tr>
<tr>
<td>2 years in 10 earlier than--</td>
<td>Oct. 7</td>
</tr>
<tr>
<td>5 years in 10 earlier than--</td>
<td>Oct. 20</td>
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### Table 3.--Growing Season

(Recorded in the period 1971-2000 at Chaco Canyon National Monument, NM1647)

<table>
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<tr>
<th>Probability</th>
<th>Daily minimum temperature during growing season</th>
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<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Higher than 24 oF</td>
<td>Higher than 28 oF</td>
<td>Higher than 32 oF</td>
<td></td>
</tr>
<tr>
<td>Days</td>
<td>Days</td>
<td>Days</td>
<td>Days</td>
<td></td>
</tr>
<tr>
<td>9 years in 10</td>
<td>132</td>
<td>117</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>8 years in 10</td>
<td>140</td>
<td>125</td>
<td>101</td>
<td></td>
</tr>
<tr>
<td>5 years in 10</td>
<td>157</td>
<td>141</td>
<td>116</td>
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<td>2 years in 10</td>
<td>174</td>
<td>156</td>
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<tr>
<td>1 year in 10</td>
<td>183</td>
<td>164</td>
<td>139</td>
<td></td>
</tr>
</tbody>
</table>

(Recorded in the period 1971-2000 at Gallup FAA AP, NM 3422)

| 9 years in 10     | 134              | 110              | 92               |
| 8 years in 10     | 143              | 119              | 101              |
| 5 years in 10     | 159              | 137              | 117              |
| 2 years in 10     | 176              | 155              | 133              |
| 1 year in 10      | 184              | 164              | 142              |
Table 3.--Growing Season--Continued

(Recorded in the period 1971-2000 at Otis, NM6465)

<table>
<thead>
<tr>
<th>Probability</th>
<th>Daily minimum temperature during growing season</th>
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<td>196</td>
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<td>214</td>
<td>192</td>
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<td>223</td>
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(Recorded in the period 1971-2000 at Window Rock 4 SW, AZ9410)

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