United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Bureau of Indian Affairs, The Navajo Nation, Chinle Soil and Water Conservation District, Navajo Mountain Soil and Water Conservation District, and the Arizona Agricultural Experiment Station

Soil Survey of the Chinle Area, Parts of Apache and Navajo Counties, Arizona, and San Juan County, New Mexico

How To Use This Soil Survey

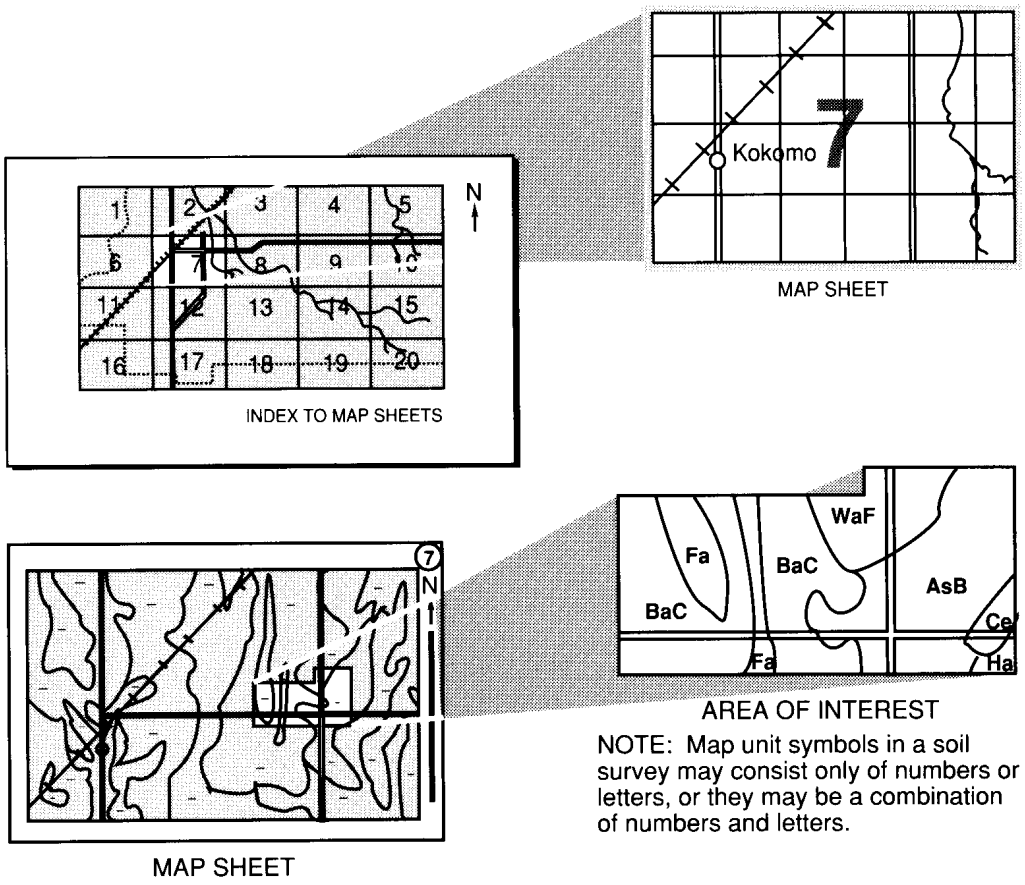
Detailed Soil Maps

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.

National Cooperative Soil Survey

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

Major fieldwork for this soil survey was completed in June 2010. Soil names and descriptions were approved in July 2010. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2010. This survey was made cooperatively by the Natural Resources Conservation Service, the Bureau of Indian Affairs, and the Arizona Agricultural Experiment Station. The survey is part of the technical assistance furnished to the Navajo Nation, Arizona.

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

Citation

The correct citation for this survey is as follows:

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Cover caption

This view comes from the base of the Chuska Mountains north of the village Lukachukai, facing Northeast.

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

Contents

Issued 2011

Foreword

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

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Soil Survey of Chinle Area, Parts of Apache and Navajo Counties, Arizona, and San Juan County, New Mexico

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General Nature of the Survey Area

The Chinle soil survey covers approximately 1,930,000 acres in north Navajo County, Arizona, northwestern Apache County, Arizona, and the southwestern tip of San Juan County, New Mexico. It includes grazing districts 4, 10, and 11 within Arizona. Elevations in the survey area range from a low of about 5,500 feet in the Chinle Valley to above 9,500 feet in the Chuska Mountains. Most areas range from 5,000 to 6,500 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. The survey area has very little perennial surface water.

Figure 1.—Location of the survey area in Arizona and New Mexico.

The major watershed is Chinle Wash and its many tributaries that flow north through the Chinle Valley.

Coal mining, commercial woodcutting, tourism, farming, 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 limited acres of irrigated cropland and nonirrigated cropland. The main crops are alfalfa hay and winter wheat. The main factors that restrict land use for crops are short growing season, low rainfall, droughty soils, and inadequate irrigation. The availability of water throughout the Chinle Valley provides opportunities for irrigated farmland near the townships of Chinle and Many Farms. Also, the capture of snowmelt into reservoirs allows irrigated farming near Round Rock, Lukachukai, and Tsaile.

Transportation Facilities

One major highway currently serves the survey area. U.S. Highway 191 runs north to south through the Chinle Valley. The remainder of the survey is served by Indian Reservation Routes and a myriad of unpaved roads. For the most part, the survey area is remote and has limited accessibility.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; 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 from 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 in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil 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-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. 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 are generally 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 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 assure 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.

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 slopes 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 alluvial fans and fan remnants show greater development. Deposition of parent material still occurs on alluvial fans. Fan remnants 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.

Detailed Soil Map Units and Classification of the Soils

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 use.

Soil Map Unit Descriptions

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 a taxonomic class 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 non-contrasting, 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. The contrasting components are mentioned in the map unit descriptions and listed under minor components. 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 most 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, Monue sandy clay loam, moderately deep, 0 to 3 percent slopes, is a phase of the Monue series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, and 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 at a scale of approximately 1: 24,000. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Akhoni-Typic Argiustolls-Tuntsa complex, 15 to 75 percent slopes, is an example.

Associations are groups of soils or miscellaneous areas geographically associated in a characteristic repeating pattern that can be separated at a scale of approximately 1: 24,000. An example is Ustifluventic Haplocambids-Ustic Haplocambids, rocky Riverwash association, 1 to 70 percent slopes.

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. Tekapo and Lithic Ustic Torriorthents soils and Rock outcrop, 5 to 65 percent slopes, is an undifferentiated group in this survey.

This survey includes miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Riverwash and Rock outcrop are examples.

This survey includes 10 detailed soil map units that join adjacent soil surveys and share specific documentation. An example of this is Arabrab-Vessilla-Lindrith complex, 1 to 45 percent slopes.Under the Location in the Typical Profile section, it states “Map unit originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.”

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1998 and 1999). 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 Alfisols.

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 Ustalfs (Ust, meaning ustic soil moisture regime, plus alf, from Alfisols).

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 Haplustalfs (Hapl, meaning minimal horizonation; ustalf, the suborder of the Alfisols that has an ustic soil moisture regime).

SUBGROUP. Each great group has a Typic subgroup. Other subgroups are intergrades or extragrades. The Typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Lithic identifies the subgroup having a shallow soil depth before bedrock. An example is Lithic Haplustalfs.

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, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is Loamy, mixed, superactive, mesic Lithic Haplustalfs.

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. An example is the Arabrab series.

In the map unit descriptions, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series for a particular map unit. A pedon, a small three-dimensional area of soil, which is typical of the series within that map unit in the survey area, is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (USDA, 1993).

Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (USDA, 1999) and in “Keys to Soil Taxonomy” (USDA, 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.

Soil Descriptions

1—Akhoni-Typic Argiustolls-Tuntsa complex, 15 to 75 percent slopes

Map Unit Setting

Landform(s): mountain slopes, terraces
Elevation: 7,700 to 9,100 feet (2,347 to 2,774 meters)
Mean annual precipitation: 22 to 26 inches (559 to 660 millimeters)
Mean annual air temperature: 39 to 45 degrees F (3.9 to 7.2 degrees C)
Mean annual soil temperature: 41 to 47 degrees F (5.0 to 8.3 degrees C)
Frost-free period: 100 to 120 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-9AZ Colorado Plateau Coniferous Forests

Map Unit Composition

Akhoni and similar soils: 45 percent
Typic Argiustolls and similar soils: 30 percent
Tuntsa and similar soils: 15 percent
Minor Components: 10 percent
- Rock outcrop
- Gullied land

Soil Properties and Qualities

Akhoni soils
Taxonomic classification: Loamy, mixed, superactive, frigid Lithic Haplustolls
Geomorphic position: occurs on side slopes and structural benches on mountain tops
Parent material: alluvium derived from sandstone and/or residuum weathered from sandstone
Slope: 15 to 75 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 70 percent
woody debris: 20 percent
bare soil: 10 percent
surface rock fragments

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: moderately well drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 1.7 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: D
Present vegetation: Douglas fir, mutton bluegrass, ponderosa pine, quaking aspen
Land capability (non irrigated): 5c

Typical Profile

Location
Geographic Coordinate System: 36° 23’ 1.00’’ north, 109° 6’ 49.30’’ west

Oe—0 to 3 inches (0 to 8 cm); very dark grayish brown (10YR 3/2) moderately decomposed plant material, very dark brown (10YR 2/2), moist; 13 percent clay; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

A—3 to 12 inches (8 to 30 cm); brown (7.5YR 5/2) sandy loam, dark brown (7.5YR 3/2), moist; 13 percent clay; weak fine subangular blocky parts to weak fine granular structure; soft, very friable, slightly sticky, nonplastic; common medium roots, common coarse roots, many very fine roots, and many fine roots throughout; common very fine irregular and common fine irregular pores; 5 percent cobble; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

BC—12 to 19 inches (30 to 48 cm); brown (7.5YR 5/3) loamy fine sand, brown (7.5YR 4/3), moist; 8 percent clay; massive; soft, very friable, nonsticky, nonplastic; common medium roots, many very fine and common fine roots throughout; common very fine and fine irregular pores; 10 percent cobble; noneffervescent; neutral, pH 7.0.

R—19 inches (48 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

Oe horizons
- Hue: 10YR
- Value: 3 dry or moist
- Chroma: 1 to 2, dry or moist
- Clay: 4 to 25 percent
- Reaction: moderately acid to neutral

A horizons
- Hue: 7.5YR, 10YR
- Value: 3 to 5 dry, 3 moist
- Chroma: 2 to 3, dry ormoist
- Texture: loam, silty loam, fine sandy loam, sandy loam
- Clay: 4 to 25 percent
- Reaction: moderately acid to neutral

BC horizons
- Hue: 7.5YR, 10YR
- Value: 3 to 6 dry, 4 to 5 moist
- Chroma: 3 to 4, dry or moist
- Texture: loamy fine sand, very fine sandy loam, fine sand, loamy sand, sandy loam
- Clay: 3 to 10 percent
- Reaction: slightly acid to neutral

Mollic epipedon – the zone from 3 to 12 inches (A horizon).

Some pedons have a thin Cd horizon above the R horizon.

Typic Argiustolls soils
Taxonomic classification: Typic Argiustolls
Geomorphic position: occurs on footslopes and terraces on mountain tops
Parent material: residuum weathered from basalt
Slope: 25 to 65 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 75 percent
  - woody debris: 25 percent
  - bare soil: 0 percent
- surface rock fragments

Drainage class: well drained
Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

Available water capacity total inches: 9.4 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: high
Hydrologic group: B
Present vegetation: Douglas fir, Gambel oak, ponderosa pine, quaking aspen
Land capability (non irrigated): 5c

Typical Profile

Location
Geographic Coordinate System: 36° 19’ 41.20’’ north, 109° 6’ 1.80’’ west

Oe—0 to 1 inch (0 to 3 cm); very dark grayish brown (10YR 3/2) moderately decomposed plant material, very dark brown (10YR 2/2), moist; 15 percent clay; noneffervescent; neutral, pH 6.6.

A—1 to 11 inches (3 to 28 cm); dark brown (7.5YR 3/2) loam, very dark gray (7.5YR 3/1), moist; 15 percent clay; weak medium subangular blocky parts to weak medium granular structure; soft, very friable, nonsticky, nonplastic; common medium, coarse, very coarse, very fine, and fine roots throughout; common very fine tubular pores; noneffervescent; neutral, pH 6.6; abrupt wavy boundary.

Bt1—11 to 20 inches (28 to 51 cm); reddish brown (5YR 4/3) sandy clay loam, dark reddish brown (5YR 3/3), moist; 30 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common medium, coarse, very coarse, very fine, and fine roots throughout; common very fine tubular pores; few distinct dark reddish gray (5YR 4/2), dry, clay films on all faces of peds; noneffervescent; slightly acid, pH 6.2; abrupt wavy boundary.

Bt2—20 to 60 inches (51 to 152 cm); reddish brown (5YR 4/3) sandy clay loam,bluish black (5B 3/1), moist; 34 percent clay; strong medium angular blocky structure; moderately hard, friable, very sticky, very plastic; common medium and coarse roots, common very fine and fine roots throughout; common very fine tubular pores; few distinct dark reddish gray (5YR 4/2), dry, clay films on all faces of peds; noneffervescent; slightly acid, pH 6.4.

Range in Characteristics

Typic Argiustolls have properties that vary greater than family class limits.

Oe horizon
- Hue: 10YR
- Value: 2 or 3, dry or moist
- Chroma: 2, dry or moist
- Clay: 6 to 15 percent
- Reaction: slightly acid to neutral

A horizon
- Hue: 7.5YR
- Value: 3 to 5 dry,2 to 3 moist
- Chroma: 1 to 3, dry or moist
- Texture: loam, fine sandy loam, very fine sandy loam
- Clay: 6 to 15 percent

Bt horizons
- Hue: 5YR, 7.5YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 1 to 3, dry or moist
- Texture: loam, very fine sandy loam, sandy clay loam, fine sandy loam
- Clay: 8 to 45 percent
- Reaction: slightly acid to neutral

Mollic epipedon – the zone from 1 to 11 inches (A horizon).

Argillic horizon – zone from 11 to 60 inches (Bt horizons).

Tuntsa soils
Taxonomic classification: Coarse-loamy, mixed, superactive, frigid Typic Haplustolls

Geomorphic position: occurs on footslopes and fan terraces
Parent material: residuum weathered from sandstone
Slope: 15 to 50 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 70 percent
    woody debris: 25 percent
    bare soil: 5 percent
  surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 6.8 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: high
Hydrologic group: C
Present vegetation: Douglas-fir, Gambel oak, ponderosa pine, quaking aspen
Land capability (non irrigated): 5c

Typical Profile

Location
Geographic Coordinate System: 36° 19’ 29.70’’ north, 109° 5’ 43.50’’ west

Oe—0 to 1 inch (0 to 3 cm); very dark gray (10YR 3/1) moderately decomposed plant material, black (10YR 2/1), moist; 8 percent clay; moderately hard, friable, very sticky, very plastic; noneffervescent; slightly acid, pH 6.2.

A—1 to 11 inches (3 to 28 cm); dark brown (7.5YR 3/2) loam, very dark gray (7.5YR 3/1), moist; 8 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common medium, coarse, very fine, and fine roots throughout; common very fine tubular pores; noneffervescent; slightly acid, pH 6.2; gradual wavy boundary.

Bw1—11 to 37 inches (28 to 94 cm); dark brown (7.5YR 3/4) fine sandy loam, dark brown (7.5YR 3/2), moist; 10 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common medium, coarse, very fine, and fine roots throughout; common very fine tubular pores; noneffervescent; slightly acid, pH 6.2; clear wavy boundary.

Bw2—37 to 60 inches (94 to 152 cm); brown (7.5YR 4/4) sandy loam, dark brown (7.5YR 3/3), moist; 12 percent clay; moderate medium subangular blocky structure; soft, friable, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine tubular pores; noneffervescent; moderately acid, pH 6.0.

Range in Characteristics

Tuntsa as used in this survey is a taxadjunct to the series because the Mollic epipedon is less than 18 inches thick. Tuntsa series is a Coarse-loamy, mixed, superactive, frigid Pachic Haplustolls.

Oe horizon
Hue: 10YR
Value: 2 or 3, dry or moist
Chroma: 1 dry or moist
Clay: 8 percent

A horizon
Hue: 7.5YR, 10YR
Value: 3 to 4 dry, 2.5 to 3 moist
Chroma: 1 to 3, dry or moist
Texture: loam, sandy loam, silty loam
Clay: 4 to 10 percent
Reaction: slightly acid to neutral

Bw horizons
Hue: 5YR, 7.5YR
Value: 3 to 5 dry, 3 moist
Chroma: 2 to 4, dry or moist
Texture: sandy loam, fine sandy loam
Clay: 8 to 12 percent
Reaction: moderately acid to slightly acid

Mollic epipedon – the zone from 1 to 11 inches.

Cambic horizon – the zone from 11 to 60 inches.

2—Aneth-Naha-Sheppard family complex, 0 to 2 percent slopes

Map Unit Setting

Landform(s): flood plains
Elevation: 5,000 to 5,500 feet (1,524 to 1,676 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to 15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Aneth and similar soils: 55 percent
Naha and similar soils: 20 percent
Sheppard family and similar soils: 15 percent
Minor Components: 10 percent
- Gullied land
- Riverwash
- Water
- Active dunes and sandsheets
- Torrifluvents with thin strata of clay greater than 25 percent

Soil Properties and Qualities

Aneth soils
Taxonomic classification: Sandy, mixed, mesic Typic Torriorthents
Geomorphic position: occurs on floodplains

Parent material: alluvium derived from sandstone
Slope: 0 to 2 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 3 percent
    woody debris: 0 percent
    bare soil: 82 percent
  surface rock fragments
    gravel: 15 percent

Drainage class: excessively drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity total inches: 5.3 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: occasional
Runoff class: low
Hydrologic group: A
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 13’ 52.00’’ north, 109° 33’ 26.30’’ west

C1—0 to 18 inches (0 to 46 cm); light reddish brown (5YR 6/4) gravelly sand, reddish brown (5YR 5/4), moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine roots throughout; 15 percent gravel; noneffervescent; slightly alkaline, pH 7.8; gradual smooth boundary.

C2—18 to 34 inches (46 to 86 cm); light reddish brown (5YR 6/4) sand, reddish brown (5YR 5/4), moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine roots throughout; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

2C3—34 to 60 inches (86 to 152 cm); light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 4/4), moist; 16 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; common very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

Clay content of control section (weighted average): 1 to 10 percent

C horizons
  Hue: 5YR, 7.5YR, 10YR
  Value: 4 to 7 dry, 3 to 6 moist
  Chroma: 2 to 6 dry, 3 to 6 moist
  Texture: coarse sand, sand, fine sand, loamy sand, loamy fine sand, fine sandy loam
  Clay: 1 to 15 percent
  Reaction: slightly alkaline to strongly alkaline

Naha soils
Taxonomic classification: Sandy over loamy, mixed, superactive, calcareous, mesic Typic Torriorthents
Geomorphic position: occurs on floodplains
Parent material: alluvium derived from sandstone
Slope: 0 to 2 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 20 percent
woody debris: 0 percent
bare soil: 75 percent
surface rock fragments
gravel: 5 percent

Drainage class: somewhat excessively drained
Ksat solum: 0.20 to 19.98 inches per hour (1.40 to 141.00 micrometers per second)

Available water capacity total inches: 6.5 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: occasional
Runoff class: low
Hydrologic group: C
Present vegetation: broom snakeweed, Douglas rabbitbrush, Russian thistle
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 13’ 59.20’’ north, 109° 33’ 42.90’’ west

A—0 to 4 inches (0 to 10 cm); reddish brown (5YR 5/4) loamy sand, reddish brown (5YR 4/4), moist; 6 percent clay; weak thin platy parts to weak fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine irregular pores; 5 percent gravel; very slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

2C1—4 to 28 inches (10 to 71 cm); light reddish brown (5YR 6/4) sand, reddish brown (5YR 5/4), moist; 4 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine roots throughout; common very fine irregular pores; 10 percent gravel; very slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

2C2—28 to 60 inches (71 to 152 cm); reddish brown (5YR 5/4) loam, reddish brown (5YR 4/3), moist; 24 percent clay; massive; slightly hard, friable, moderately sticky, moderately plastic; common very fine roots throughout; common very fine dendritic tubular pores; 2 percent gravel; strongly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

Clay content of the control section (weighted average): 10 to 18 percent
Rock fragments of the control section (weighted average): 0 to 10 percent

A horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 to 4, dry or moist
- Texture: coarse sand, loamy sand, sandy loam, very fine sandy loam, loam, silt loam
- Clay: 2 to 20 percent
- Reaction: moderately alkaline to strongly alkaline

2C horizons
- Hue: 5YR, 7.5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 4 to 6 dry, 3 to 4 moist
- Texture: coarse sand, sand, fine sand, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silty clay loam
- Clay: 2 to 30 percent
- Reaction: moderately alkaline to strongly alkaline
- Rock fragments: 0 to 10 percent

Lithologic discontinuity – contrasting sand sizes in the zone from 20 to 35 inches.

Sheppard family soils
Taxonomic classification: Mixed, mesic Typic Torripsamments
Geomorphic position: occurs on floodplains
Parent material: alluvium derived from sandstone
Slope: 0 to 2 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 5 percent
  - woody debris: 0 percent
  - bare soil: 90 percent
- surface rock fragments
  - gravel: 5 percent

Drainage class: excessively drained
Ksat solum: 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)

Available water capacity total inches: 3.4 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: occasional
Runoff class: low
Hydrologic group: A
Present vegetation: Russian thistle, threeawn

Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 14’ 23.50’’ north, 109° 34’ 12.00’’ west

C1—0 to 18 inches (0 to 46 cm); light reddish brown (5YR 6/4) sand, reddish brown (5YR 5/4), moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine roots throughout; 10 percent gravel; noneffervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C2—18 to 38 inches (46 to 97 cm); light reddish brown (5YR 6/4) gravelly coarse sand, reddish brown (5YR 4/4), moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine roots throughout; 20 percent gravel; noneffervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C3—38 to 60 inches (97 to 152 cm); light reddish brown (5YR 6/4) loamy sand, reddish brown (5YR 4/4), moist; 8 percent clay; single grain; loose, loose, nonsticky, nonplastic; 5 percent stone; noneffervescent; moderately alkaline, pH 8.0.

Range in Characteristics

Sheppard family differs from the series because they have rock fragments of 0-20 percent and textures of coarse sand.

C horizons
- Hue: 5YR, 7.5YR
- Value: 5 to 7 dry, 4 to 6 moist
- Chroma: 4 to 6 dry, 3 to 6 moist
- Texture: coarse sand, sand, fine sand, loamy sand, loamy fine sand
- Clay: 2 to 8 percent
- Reaction: moderately alkaline to strongly alkaline
- Rock fragments: 0 to 20 percent

3—Aquima-Rizno-Begay complex, 1 to 15 percent slopes

Map Unit Setting

Landform(s): structural benches
Elevation: 5,500 to 6,800 feet (1,677 to 2,073 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-1AZ Colorado Plateau Mixed Grass Plains

Map Unit Composition

Aquima and similar soils: 40 percent
Rizno and similar soils: 35 percent
Begay and similar soils: 20 percent
Minor Components: 5 percent
- Riverwash
- Rock outcrop
- Soils similar to Rizno with finer textures in the control section.
- Soils similar to Begay with coarser textures in the control section.

Soil Properties and Qualities

Aquima soils
Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocambids
Geomorphic position: occurs on hills and structural benches on plateaus

Parent material: eolian deposits over residuum weathered from sandstone and/or residuum weathered from conglomerate
Slope: 1 to 4 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 40 percent
woody debris: 0 percent
bare soil: 59 percent
surface rock fragments
gravel: 1 percent

Drainage class: well drained
Ksat solum: 0.00 to 1.98 inches per hour (0.01 to 14.00 micrometers per second)

Available water capacity total inches: 9.4 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: medium
Hydrologic group: C
Present vegetation: Bigelow sagebrush, broom snakeweed, cheatgrass, Douglas rabbitbrush, galleta, pinyon, purple threeawn, rubber rabbitbrush, Utah juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 21’ 55.00’’ north, 109° 20’ 47.40’’ west

A—0 to 3 inches (0 to 8 cm); reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 4/6), moist; 23 percent clay; weak medium platy and moderate fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; many very fine and fine roots throughout; many very fine and fine dendritic tubular pores; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

AB—3 to 10 inches (8 to 25 cm); strong brown (7.5YR 5/6) sandy clay loam, brown (7.5YR 4/4), moist; 25 percent clay; moderate thick platy parts to moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common medium, very fine, and fine roots throughout; common medium, very fine, and fine dendritic tubular pores; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw1—10 to 17 inches (25 to 43 cm); yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6), moist; 25 percent clay; moderate coarse subangular blocky parts to moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots and many fine roots throughout; common very fine and many fine dendritic tubular pores; 1 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bw2—17 to 31 inches (43 to 79 cm); yellowish red (5YR 5/6) fine sandy loam, 5YR 4/5 (5YR 4/5), moist; 18 percent clay; moderate coarse subangular blocky parts to moderate medium subangular blocky structure; slightly hard, friable, slightly sticky,

slightly plastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; 2 percent gravel; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bw3—31 to 38 inches (79 to 97 cm); yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6), moist; 28 percent clay; moderate coarse subangular blocky parts to moderate medium subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; 1 percent gravel; violently effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Ck—38 to 58 inches (97 to 147 cm); reddish yellow (7.5YR 6/6) fine gravelly sandy clay loam, strong brown (7.5YR 4/6), moist; 22 percent clay; weak fine subangular blocky structure; hard, very firm, moderately sticky, very plastic; common fine roots throughout; common fine dendritic tubular pores; 25 percent gravel and 5 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear smooth boundary.

2C—58 to 70 inches (147 to 178 cm); yellowish red (5YR 5/6) very gravelly sandy clay loam, reddish brown (5YR 4/4), moist; 23 percent clay; massive; slightly hard, friable, moderately sticky, moderately plastic; 10 percent gravel and 30 percent gravel; violently effervescent; strongly alkaline, pH 8.8.

Range in Characteristics

Clay content of the control section (weighted average): 18 to 33 percent

A and AB horizons
- Hue: 5YR, 7.5YR
- Value: 5 to 6 dry, 4 to 6 moist
- Chroma: 4 to 6, dry or moist
- Texture: loamy fine sand, sandy loam, fine sandy loam, very fine sandy loam, loam, sandy clay loam
- Clay: 6 to 25 percent
- Reaction: moderately alkaline

Bw horizons
- Hue: 5YR
- Value: 5 to 6 dry, 4 to 6 moist
- Chroma: 4 to 6, dry or moist
- Texture: loamy fine sand, sandy loam, fine sandy loam, very fine sandy loam, loam, sandy clay loam
- Clay: 12 to 33 percent
- Reaction: moderately alkaline to strongly alkaline
- Rock fragments: 0 to 5 percent

Ck and 2C horizons
- Hue: 5YR, 7.5YR
- Value: 4 to 6, dry or moist
- Chroma: 4 to 6, dry or moist
- Texture: fine sandy loam, loam, sandy clay loam
- Clay: 10 to 28 percent
- Reaction: moderately alkaline to strongly alkaline
- Calcium carbonate equivalent: 0 to 4 percent

Cambic horizon – the zone from 10 to 38 inches (Bw horizons).

Rizno soils

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Geomorphic position: occurs on hills and structural benches on plateaus
Parent material: eolian deposits derived from sandstone over residuum weathered from sandstone and/or residuum weathered from conglomerate
Slope: 1 to 15 percent
Surface cover
Biological crust
cyanobacteria: 5 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 40 percent
woody debris: 5 percent
bare soil: 50 percent
surface rock fragments

Depth to restrictive feature(s): 4 to 20 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)
Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 0.5 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: D
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 6’ 6.20’’ north, 109° 30’ 36.70’’ west

A—0 to 1 inch (0 to 3 cm); light brown (7.5YR 6/4) gravelly sandy loam, brown (7.5YR 5/4), moist; 10 percent clay; single grain; loose, loose, slightly sticky, nonplastic; few very fine roots and few fine roots throughout; common interstitial pores; 15 percent gravel; slightly effervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

C—1 to 6 inches (3 to 15 cm); light reddish brown (5YR 6/4) gravelly sandy loam, reddish brown (5YR 5/4), moist; 15 percent clay; massive; soft, very friable, slightly sticky, nonplastic; few fine roots throughout; few interstitial pores; 20 percent gravel; strongly effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

R—6 inches (15 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

Clay content of the control section (weighted average): 6 to 18 percent
Rock fragments of the control section: 0 to 20 percent

A horizon
Hue: 5YR, 7.5YR
Value: 5 to 6 dry, 5 moist

Chroma: 3 to 6, dry or moist
Texture: loamy sand, loamy fine sand, sandy loam, fine sandy loam
Clay: 6 to 17 percent
Reaction: moderately alkaline

C horizon
Hue: 2.5YR, 5YR
Value: 5 to 6 dry, 4 to 5 moist
Chroma: 3 to 6, dry or moist
Texture: loamy sand, loamy fine sand, sandy loam, fine sandy loam
Clay: 7 to 18 percent

Begay soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
Geomorphic position: occurs on hills and structural benches on plateaus
Parent material: eolian sands derived from sandstone over residuum weathered from sandstone
Slope: 2 to 4 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 5 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 50 percent
woody debris: 5 percent
bare soil: 40 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

Available water capacity total inches: 4.8 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: B
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 21’ 28.10’’ north, 109° 21’ 20.10’’ west

A—0 to 3 inches (0 to 8 cm); yellowish red (5YR 4/6) loamy sand, dark reddish brown (5YR 3/4), moist; 6 percent clay; weak fine subangular blocky and weak medium granular structure; soft, very friable, slightly sticky, nonplastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; very slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bw1—3 to 10 inches (8 to 25 cm); reddish yellow (5YR 6/6) sandy loam, yellowish red (5YR 4/6), moist; 16 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots

throughout; many very fine and fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bw2—10 to 20 inches (25 to 51 cm); yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6), moist; 12 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

Bw3—20 to 42 inches (51 to 107 cm); yellowish red (5YR 5/6) loamy sand, yellowish red (5YR 4/6), moist; 9 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; strongly effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

BCn—42 to 60 inches (107 to 152 cm); light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 5/4), moist; 13 percent clay; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; few fine roots throughout; few fine dendritic tubular pores; strongly effervescent; strongly alkaline, pH 8.8; abrupt smooth boundary.

Range in Characteristics

A horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: loamy sand, loamy fine sand, sandy loam, fine sandy loam
- Clay: 6 to 15 percent
- Reaction: moderately alkaline

Bw horizons
- Hue: 5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: loamy sand, sandy loam, fine sandy loam
- Clay: 9 to 18 percent
- Reaction: moderately alkaline to strongly alkaline

BCn horizon
- Hue: 5YR
- Value: 5 to 6 dry, 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: loamy fine sand, sandy loam, fine sandy loam
- Clay: 2 to 16 percent
- Reaction: moderately alkaline to strongly alkaline

Cambic horizon – the zone from 3 to 20 inches (Bw horizons).

Some pedons have a Bw horizon that does not meet the requirements of a cambic diagnostic horizon because of coarse textures.

4—Aquima-Ustic Haplocambids complex, 1 to 6 percent slopes

Map Unit Setting

Landform(s): plateaus, structural benches

Elevation: 6,300 to 6,800 feet (1,920 to 2,073 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush – Grasslands

Map Unit Composition

Aquima and similar soils: 70 percent
Ustic Haplocambids and similar soils: 15 percent
Minor Components: 15 percent
- Abra and similar soils
- Begay and similar soils
- Sodic Ustic Haplocambids and similar soils
- Gullied land
- Rock outcrop
- Soils similar to Aquima with coarser textures in the control section

Soil Properties and Qualities

Aquima soils
Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocambids
Geomorphic position: occurs on structural benches on plateaus and mesa tops of the Defiance uplift
Parent material: alluvium derived from sandstone and/or eolian sands derived from sandstone
Slope: 1 to 6 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 20 percent
woody debris: 1 percent
bare soil: 79 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.57 to 19.98 inches per hour (4.00 to 141.00 micrometers per second)

Available water capacity total inches: 8.8 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: very low
Hydrologic group: B
Present vegetation: broom snakeweed, Douglas rabbitbrush, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 17’ 35.90’’ north, 109° 22’ 13.80’’ west

A—0 to 3 inches (0 to 8 cm); strong brown (7.5YR 4/6) loamy very fine sand, brown (7.5YR 4/4), moist; 5 percent clay; single grain; loose, loose, slightly sticky, slightly plastic; common very fine and fine roots throughout; very slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

Bw—3 to 11 inches (8 to 28 cm); strong brown (7.5YR 4/6) fine sandy loam, brown (7.5YR 4/4), moist; 8 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky, moderately plastic; common medium and fine roots throughout; common very fine and fine dendritic tubular pores; very slightly effervescent; moderately alkaline, pH 7.9; clear smooth boundary.

Bk1—11 to 18 inches (28 to 46 cm); strong brown (7.5YR 5/6) fine sandy loam, strong brown (7.5YR 4/6), moist; 17 percent clay; moderate medium angular blocky and moderate fine angular blocky structure; very hard, very firm, slightly sticky, moderately plastic; common fine roots throughout; common very fine and fine dendritic tubular pores; common fine carbonate masses; very slightly effervescent, 5 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; clear smooth boundary.

Bk2—18 to 41 inches (46 to 104 cm); brown (7.5YR 4/4) sandy clay loam, strong brown (7.5YR 5/6), moist; 21 percent clay; moderate fine angular blocky and moderate medium angular blocky structure; very hard, very firm, moderately sticky, moderately plastic; common very fine roots throughout; common medium, very fine, and fine dendritic tubular pores; common fine carbonate masses; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk3—41 to 51 inches (104 to 130 cm); pink (7.5YR 7/4) sandy clay loam, strong brown (7.5YR 5/6), moist; 20 percent clay; moderate fine angular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine roots throughout; common very fine dendritic tubular pores; many fine carbonate masses; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk4—51 to 60 inches (130 to 152 cm); light brown (7.5YR 6/4) fine sandy loam, strong brown (7.5YR 5/6), moist; 12 percent clay; moderate fine angular blocky structure; very hard, friable, slightly sticky, moderately plastic; common very fine roots throughout; common very fine dendritic tubular pores; common fine carbonate masses; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Range in Characteristics

Clay content of the control section (weighted average): 18 to 32 percent

A horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 4 moist
- Chroma: 4 to 6 dry, 4 moist
- Texture: loamy fine sand, loamy very fine sand, fine sandy loam, loam
- Clay: 4 to 16 percent
- Reaction: slightly alkaline to strongly alkaline

Bw horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 5, dry or moist
- Chroma: 4 to 6, dry or moist
- Texture: fine sandy loam, sandy loam, loam, sandy clay loam, clay loam
- Clay: 17 to 32 percent
- Reaction: moderately alkaline to strongly alkaline

Bk horizons
Hue: 5YR, 7.5YR
Value: 5 to 7 dry, 4 to 5 moist
Chroma: 4 to 6 dry, 6 moist
Texture: sandy loam, fine sandy loam, loam, sandy clay loam, clay loam
Clay: 10 to 32 percent
Reaction: slightly alkaline to strongly alkaline
Calcium carbonate equivalent: 5 to 10 percent

Cambic horizon – the zone from 3 to 51 inches (Bw and Bk horizons).

Ustic Haplocambids soils
Taxonomic classification: Ustic Haplocambids
Geomorphic position: occurs on structural benches on plateaus and mesa tops of the Defiance uplift
Parent material: eolian sands derived from sandstone over residuum weathered from sandstone
Slope: 3 to 5 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 2 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 40 percent
woody debris: 8 percent
bare soil: 50percent
surface rock fragments

Depth to restrictive feature(s): 15 to 40 inches to bedrock, paralithic; 20 to 60 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 3.4 (low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: C
Present vegetation: Atridentata, broom snakeweed, cactus, Colorado pinyon, galleta, needle and thread, ricegrass, slimstalk spiderling, Utah juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 17’ 39.20’’ north, 109° 23’ 54.50’’ west

A—0 to 3 inches (0 to 8 cm); strong brown (7.5YR 5/6) fine sandy loam, strong brown (7.5YR 4/6), moist; 15 percent clay; weak fine subangular blocky and weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common very fine roots throughout; common fine dendritic tubular pores; slightly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bw—3 to 10 inches (8 to 25 cm); reddish brown (5YR 4/4) sandy clay loam, yellowish red (5YR 4/6), moist; 22 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, moderately plastic; common medium and fine roots throughout; common fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk—10 to 18 inches (25 to 46 cm); brown (7.5YR 5/4) sandy clay loam, strong brown (7.5YR 4/6), moist; 25 percent clay; weak fine subangular blocky and moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common medium, coarse, very fine, and fine roots throughout; common medium dendritic and fine dendritic tubular pores; common medium and coarse carbonate masses; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear wavy boundary.

Ck—18 to 23 inches (46 to 58 cm); pink (7.5YR 7/4) sandy loam, strong brown (7.5YR 5/6), moist; 12 percent clay; moderate medium angular blocky and moderate fine angular blocky structure; moderately hard, friable, slightly sticky, nonplastic; common medium and fine roots throughout; common very fine dendritic tubular pores; 4 percent channer; violently effervescent, 5 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt irregular boundary.

Cr—23 to 36 inches (58 to 91 cm); weathered, fractured sandstone bedrock; abrupt wavy boundary.

R—36 inches (91 cm); unweathered, fractured sandstone bedrock.

Range in Characteristics

Ustic Haplocambids have soil properties that vary greater than family class limits.

A horizon
- Hue: 5YR, 7.5 YR
- Value: 4 or 5 dry or moist
- Chroma: 4 to 6 dry, 6 moist
- Texture: loamy fine sand, loamy very fine sand, sandy loam, fine sandy loam
- Clay: 6 to 15 percent

Bw horizon
- Hue: 5YR, 7.5 YR
- Value: 4 to 5, dry or moist
- Chroma: 4 to 6, dry or moist
- Texture: sandy clay loam, fine sandy loam
- Clay: 15 to 24 percent
- Reaction: moderately to strongly alkaline

Bk horizon
- Hue: 7.5YR
- Value: 4 or 5, dry or moist
- Chroma: 4 to 6, dry or moist
- Texture: sandy clay loam, fine sandy loam
- Clay: 8 to 25 percent
- Reaction: moderately to strongly alkaline
- Calcium carbonate equivalent: 5 to 10 percent (less than 5 percent visible)

Ck horizon
- Hue: 7.5YR
- Value: 6 to 8, dry or moist
- Chroma: 1 to 4, dry or moist
- Texture: sandy loam, loam

Clay: 12 to 20 percent
Calcium carbonate equivalent: 0 to 10 percent (carbonates are geogenic and non-diagnostic)
Rock fragments: 0 to 5 percent

Cambic horizon – the zone from 3 to 18 inches (Bw and Bk horizons).

5—Arabrab-Vessilla-Lindrith complex, 1 to 45 percent slopes

Map Unit Setting

Landform(s): canyons, mesas
Elevation: 6,700 to 8,100 feet (2,042 to 2,469 meters)
Mean annual precipitation: 14 to 18 inches (355 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (7.8 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (8.9 to 11.1 degrees C)
Frost-free period: 120 to 150 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-6AZ Colorado Plateau Pinyon-Juniper Sagebrush

Map Unit Composition

Arabrab and similar soils: 40 percent
Vessilla and similar soils: 40 percent
Lindrith and similar soils: 10 percent
Minor components: 10 percent
-Moderately deep Arabrab similar soils
- Rock outcrop
- Riverwash
- Gullied land

Map unit originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Soil Properties and Qualities

Arabrab soils
Taxonomic classification: Loamy, mixed, superactive, mesic Lithic Haplustalfs
Geomorphic position: occurs on structural benches and ledges of mesa escarpments
Parent material: eolian deposits derived from sandstone over residuum weathered from sandstone and shale
Slope: 1 to 8 percent
Surface cover
Biological crust
cyanobacteria: 10 percent
lichen: 5 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 55 percent
woody debris: 15 percent
bare soil: 15 percent
surface rock fragments

Depth to restrictive feature(s): 5 to 20 inches to bedrock, lithic
Drainage class: somewhat excessively drained
Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 2.7 (low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: very low
Hydrologic group: C
Present vegetation: Colorado pinyon, juniper, oak, Stansbury cliffrose, wheatgrass, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 37’ 42.50’’ north, 110° 23’ 6.60’’ west

A—0 to 3 inches (0 to 8 cm); brown (7.5YR 4/3) sandy loam, dark brown (7.5YR 3/3), moist; 14 percent clay; weak coarse subangular blocky structure; soft, loose, non-sticky, non-plastic; common very fine and fine roots throughout; interstitial pores; slightly effervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Btk—3 to 15 inches (8 to 38 cm); brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4), moist; 27 percent clay; moderate medium subangular blocky structure; moderately hard, friable, slightly sticky, slightly plastic; common very fine and fine roots throughout; common fine tubular pores; distinct clay bridges between sand grains and faint clay films on surfaces along root channels; common fine carbonate masses; slightly effervescent, 1 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; gradual wavy boundary.

Bk—15 to 20 inches (38 to 51 cm); yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6), moist; 14 percent clay; weak medium platy structure; moderately hard, friable, non-sticky, nonplastic; few very fine and few fine roots throughout; few very fine irregular pores; common fine carbonate masses; slightly effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt smooth boundary.

R—20 inches (51 cm); fractured, unweathered sandstone and shale bedrock.

Range in Characteristics

Clay content of the control section (weighted average): 18 to 32 percent

A horizon
- Hue: 7.5YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 3 to 4, dry or moist
- Texture: loamy sand, sandy loam, fine sandy loam, loam
- Clay: 10 to 18 percent

Btk horizon
- Hue: 7.5YR, 5YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 4 to 6, dry or moist
- Texture: sandy clay loam, clay loam

Clay: 22 to 32 percent
Calcium carbonate equivalent: 0 to 4 percent

Bk horizon
Hue: 7.5YR, 5YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 4 to 6, dry or moist
Texture: loamy sand, sandy loam, fine sandy loam, loam
Clay: 10 to 18 percent
Calcium carbonate equivalent: 0 to 4 percent

Argillic horizon – zone from 3 to 15 inches (Btk horizon).

Vessilla soils

Taxonomic classification: Loamy, mixed, superactive, nonacid, mesic, shallow Aridic Ustorthents
Geomorphic position: occurs on structural benches and ledges on mesa escarpments
Parent material: eolian deposits derived from sandstone and/or alluvium derived from sandstone and shale
Slope: 3 to 45 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 45 percent
woody debris: 5 percent
bare soil: 35 percent
surface rock fragments
channer: 10 percent
flagstone: 5 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, paralithic; 3 to 20 inches to bedrock, lithic
Drainage class: somewhat excessively drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 0.3 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: D
Present vegetation: Gambel oak, oneseed juniper, pinyon, ponderosa pine, Stansbury cliffrose, wheatgrass
Land capability (non irrigated): 6c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 38’ 27.30’’ north, 110° 22’ 56.10’’ west

C1—0 to 1 inch (0 to 3 cm); brown (7.5YR 4/3) sandy loam, dark brown (7.5YR 3/2), moist; 10 percent clay; single grain; loose, loose, nonsticky, nonplastic; common medium and few fine roots throughout; common very fine interstitial pores; 5 percent channer; noneffervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

C2—1 to 5 inches (3 to 13 cm); pink (7.5YR 7/3) channery loamy sand, light brown (7.5YR 6/3), moist; 6 percent clay; massive; soft, friable, nonsticky, nonplastic; few fine roots throughout; common fine interstitial pores; 34 percent channer; noneffervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

Cr—5 to 12 inches (13 to 30 cm); few coarse roots in cracks; fractured, weathered sandstone and shale bedrock.

R—12 inches (30 cm); fractured, unweathered sandstone and shale bedrock.

Range in Characteristics

Vessilla as used in this survey is a taxadjunct to the series because it has a paralithic contact above the lithic contact, is nonacid, and superactive. Vessilla series is a Loamy, mixed, active, calcareous, mesic Aridic Lithic Ustorthents.

C horizons
- Hue: 7.5YR
- Value: 4 to7 dry, 3 to6 moist
- Chroma: 2 to 6, dry or moist
- Texture: loamy sand, sandy loam, fine sandy loam
- Clay: 4 to 12 percent
- Rock fragments: 5 to 35 percent

Lindrith soils
Taxonomic classification: Coarse-loamy, mixed, superactive, nonacid, mesic Aridic Ustorthents
Geomorphic position: occurs on stream terraces in canyon bottoms
Parent material: eolian deposits derived from sandstone and/or alluvium derived from sandstone and shale
Slope: 1 to 20 percent
Surface cover
- Biological crust
  - cyanobacteria: 10 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 35 percent
  - woody debris: 10 percent
  - bare soil: 45 percent
- surface rock fragments

Drainage class: somewhat excessively drained
Ksat solum: 0.20 to 19.98 inches per hour (1.40 to 141.00 micrometers per second)

Available water capacity total inches: 6.8 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium

Hydrologic group: C
Present vegetation: juniper, pinyon, ponderosa pine, wheatgrass, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 38’ 4.00’’ north, 110° 23’ 0.20’’ west

A1—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4), moist; 15 percent clay; weak medium platy structure; soft, very friable, nonsticky, nonplastic; many medium and fine roots throughout; many fine irregular pores; noneffervescent; slightly alkaline, pH 7.8; gradual wavy boundary.

A2—2 to 15 inches (5 to 38 cm); 25 percent dark brown (7.5YR 3/2) and 75 percent brown (7.5YR 5/4) stratified sandy loam to loam, 25 percent dark brown (7.5YR 3/2) and 75 percent brown (7.5YR 4/4), moist; 12 percent clay; weak medium platy structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; many fine irregular pores; noneffervescent; slightly alkaline, pH 7.8; gradual wavy boundary.

C1—15 to 23 inches (38 to 58 cm); brown (7.5YR 5/4) stratified sand to loam, brown (7.5YR 4/4), moist; 22 percent clay; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots throughout; many fine tubular pores; noneffervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

C2—23 to 41 inches (58 to 104 cm); brown (7.5YR 5/4) stratified fine sandy loam to loam, brown (7.5YR 4/4), moist; 15 percent clay; massive; hard, friable, nonsticky, nonplastic; few medium and fine roots throughout; many fine tubular pores; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

2C3—41 to 65 inches (104 to 165 cm); light brown (7.5YR 6/4) stratified sand to loam, brown (7.5YR 5/4), moist; 4 percent clay; massive; loose, loose, nonsticky, nonplastic; few fine roots throughout; few very fine interstitial pores; noneffervescent; slightly alkaline, pH 7.6.

Range in Characteristics

Lindrith as used in this survey is a taxadjunct to the series because it has a nonacid reaction class. Lindrith series is a Coarse-loamy, mixed, superactive, calcareous, mesic Aridic Ustorthents.

A horizons
- Hue: 7.5YR
- Value: 3 to 5, dry or moist
- Chroma: 2 to 4, dry or moist
- Texture: loamy sand, sandy loam, fine sandy loam, loam
- Clay: 10 to 18 percent

C horizons
- Hue: 7.5YR
- Value: 3 to 6 dry, 2 to 5 moist
- Chroma: 2 to 4, dry or moist
- Texture: stratified loamy sand, sandy loam, fine sandy loam, loam, sand
- Clay: 2 to 25 percent

6—Arches-Begay-Mido complex, 1 to 25 percent slopes

Map Unit Setting

Landform(s): benches, fan remnants
Elevation: 5,600 to 6,500 feet (1,707 to 1,981 meters)
Mean annual precipitation: 10 to 14 inches (254 to356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush – Grasslands

Map Unit Composition

Arches and similar soils: 45 percent
Begay and similar soils: 25 percent
Mido and similar soils: 20 percent
Minor Components: 10 percent
- Blanding and similar soils
- Eslendo and similar soils
- Kinusta and similar soils
- Ustic Haplargids with 18 to 35 percent clay
- Rock outcrop

Map unit originates from the Soil Survey of Shiprock Area, Parts of San Juan County, New Mexico and Apache County, Arizona.

Soil Properties and Qualities

Arches soils
Taxonomic classification: Mixed, mesic Lithic Torripsamments
Geomorphic position: occurs on structural benches on mesa tops
Parent material: eolian deposits over residuum weathered from sandstone
Slope: 4 to 25 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 6.00 to 20.00 inches per hour (42.34 to 141.14 micrometers per second)
Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 1.4 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: very low
Hydrologic group: D
Present vegetation: Bigelow sagebrush, Indian ricegrass, New Mexico feathergrass, blue grama, Pleuraphis jamesii, antelope bitterbrush, Mormon tea, Stansbury cliffrose, twoneedle pinyon, Utah juniper
Land capability (non irrigated): 7s

Typical Profile

Typical profile originates from the Soil Survey of Shiprock Area, Parts of San Juan County, New Mexico and Apache County, Arizona.

Location
Geographic Coordinate System: 36° 37’ 45.00’’ north, 108° 58’ 35.00’’ west

C1—0 to 3 inches (0 to 8 cm); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6), moist; 6 percent clay; weak medium platy structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C2—3 to 7 inches (8 to 18 cm); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6), moist; 6 percent clay; single grain; loose, loose, nonsticky, nonplastic; few medium and common fine roots throughout; strongly effervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

C3—7 to 14 inches (18 to 36 cm); red (2.5YR 5/6) loamy fine sand, red (2.5YR 4/6), moist; 6 percent clay; single grain; loose, loose, nonsticky, nonplastic; few medium and very fine roots throughout; strongly effervescent; moderately alkaline, pH 8.2; gradual smooth boundary.

2C3—14 to 18 inches (36 to 46 cm); light reddish brown (2.5YR 6/4) sand, reddish brown (2.5YR 4/4), moist; 4 percent clay; single grain; slightly hard, very friable, nonsticky, nonplastic; few coarse roots and few very fine roots throughout; 15 percent gravels; slightly effervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

2R—18 inches (46 cm); unweathered, fractured sandstone bedrock.

Range in Characteristics

C and 2C horizons
- Hue: 2.5YR, 5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 2 to 6, dry or moist
- Texture: loamy fine sand, loamy sand, sand, fine sand, sand
- Reaction: slightly alkaline to moderately alkaline

Begay soils

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
Geomorphic position: occurs on fan terraces and structural benches on mesa tops
Parent material: alluvium over residuum weathered from sandstone
Slope: 1 to 6 percent
Drainage class: well drained
Ksat solum: 2.00 to 6.00 inches per hour (14.11 to 42.34 micrometers per second)

Available water capacity total inches: 9.6 (high)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: very low
Hydrologic group: A
Present vegetation: Indian ricegrass, blue grama, Hesperostipa comata ssp. comata, broom snakeweed, Ephedra cutleri, Greene rabbitbrush, Pleuraphis jamesii, sand dropseed, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 39’ 22.00’’ north, 108° 59’ 21.00’’ west

A—0 to 3 inches (0 to 8 cm); reddish brown (5YR 5/4) fine sandy loam, dark reddish brown (5YR 3/4), moist; 14 percent clay; weak medium platy parts to weak fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine roots

and few fine roots throughout; slightly effervescent; moderately alkaline, pH 7.9; clear smooth boundary.

AB—3 to 7 inches (8 to 18 cm); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4), moist; 14 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; strongly effervescent; moderately alkaline, pH 7.9; clear smooth boundary.

Bw—7 to 14 inches (18 to 36 cm); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4), moist; 16 percent clay; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine roots throughout; few fine tubular pores; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk1—14 to 30 inches (36 to 76 cm); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4), moist; 14 percent clay; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine roots throughout; common very fine and few fine tubular pores; common distinct carbonate masses; violently effervescent, 4 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear wavy boundary.

Bk2—30 to 48 inches (76 to 122 cm); reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4), moist; 14 percent clay; moderate very coarse subangular blocky structure; hard, friable, slightly sticky, nonplastic; common very fine roots throughout; common very fine and few fine tubular pores; common distinct carbonate masses; violently effervescent, 4 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear wavy boundary.

BC—48 to 60 inches (122 to 152 cm); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4), moist; 14 percent clay; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common very fine roots throughout; common very fine and few fine tubular pores; strongly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A and AB horizons
- Hue: 5YR
- Value: 5 to 6 dry,3 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: fine sandy loam, loamy fine sand
- Reaction: slightly alkaline to moderately alkaline

Bw horizon
- Hue: 5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: fine sandy loam, very fine sandy loam
- Reaction: slightly alkaline to moderately alkaline

Bk horizons
- Hue: 5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: fine sandy loam, very fine sandy loam
- Calcium carbonate equivalent: 3 to 5 percent
- Reaction: slightly alkaline to moderately alkaline

BC horizon

Hue: 5YR
Value: 5 to 6 dry, 4 to 5 moist
Chroma: 4 to 6, dry or moist
Texture: fine sandy loam, very fine sandy loam
Calcium carbonate equivalent: 3 to 5 percent
Reaction: mildly alkaline to moderately alkaline

Cambic horizon – the zone from 7 to 14 inches (Bw horizon).

Mido soils
Taxonomic classification: Mixed, mesic Ustic Torripsamments
Geomorphic position: occurs on stable dunes on mesa tops
Parent material: eolian deposits derived from sandstone
Slope: 4 to 10 percent
Drainage class: somewhat excessively drained
Ksat solum: 6.00 to 20.00 inches per hour (42.34 to 141.14 micrometers per second)

Available water capacity total inches: 5.0 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: very low
Hydrologic group: A
Present vegetation: Hesperostipa comata ssp. comata, Indian ricegrass, blue grama, antelope bitterbrush, broom snakeweed, Ephedra cutleri, fourwing saltbush, sand dropseed, sandhill muhly
Land capability (non irrigated): 7e

Typical Profile

Location
Geographic Coordinate System: 36° 37’ 52.00’’ north, 108° 58’ 28.00’’ west

A—0 to 3 inches (0 to 8 cm); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6), moist; 6 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine and common fine roots throughout; slightly effervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

C1—3 to 16 inches (8 to 41 cm); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6), moist; 6 percent clay; massive; soft, very friable, nonsticky, nonplastic; few coarse and common fine roots throughout; few very fine tubular pores; slightly effervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

C2—16 to 60 inches (41 to 152 cm); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6), moist; 6 percent clay; massive; soft, very friable, nonsticky, nonplastic; few medium and very fine roots throughout; few very fine tubular pores; slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A horizon
Hue: 5YR
Value: 5 to 6 dry, 4 to 5 moist
Chroma: 4 to 6, dry or moist
Texture: loamy fine sand

C horizons
Hue: 5YR
Value: 5 to 6 dry, 4 to 5 moist
Chroma: 4 to 6, dry or moist
Texture: loamy fine sand, fine sand

7—Aridic Ustorthents-Lindrith-Riverwash complex, 0 to 6 percent slopes

Map Unit Setting

Landform(s): alluvial flats, terraces
Elevation: 6,600 to 7,000 feet (2,012 to 2,134 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (7.8 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (8.9 to 11.1 degrees C)
Frost-free period: 120 to 150 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-6AZ Colorado Plateau Pinyon- Juniper Sagebrush

Map Unit Composition

Aridic Ustorthents and similar soils: 40 percent
Lindrith and similar soils: 40 percent
Riverwash: 15 percent
Minor Components: 5 percent
- Aridic Haplustepts
- Soils similar to Lindrith with finer textures in the particle control section

Soil Properties and Qualities

Aridic Ustorthents soils
Taxonomic classification: Aridic Ustorthents
Geomorphic position: occurs on alluvial flats and terraces formed by arroyo cuts
Parent material: alluvium derived from sandstone and siltstone
Slope: 0 to 6 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 40 percent
    woody debris: 5 percent
    bare soil: 55 percent
  surface rock fragments

Drainage class: somewhat excessively drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 10.7 (very high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: negligible
Hydrologic group: C
Present vegetation: big sagebrush, black greasewood, blue grama, broom snakeweed, fourwing saltbush, prickly Russian thistle
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 39° 19’ 5.90’’ north, 110° 13’ 48.60’’ west

C1—0 to 7 inches (0 to 18 cm); pale brown (10YR 6/3) sandy loam, dark yellowish brown (10YR 4/4), moist; 8 percent clay; massive; soft, very friable, moderately sticky, moderately plastic; common medium, very fine, and fine roots throughout; common fine interstitial pores; very slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C2—7 to 21 inches (18 to 53 cm); brown (10YR 5/3) silt loam, brown (10YR 4/3), moist; 22 percent clay; massive; moderately hard, friable, moderately sticky, very plastic; few medium and common very fine and fine roots throughout; common fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C3—21 to 39 inches (53 to 99 cm); yellowish brown (10YR 5/4) silty clay loam, brown (10YR 4/3), moist; 28 percent clay; massive; very hard, friable, moderately sticky, very plastic; few medium and common fine roots throughout; few fine irregular pores; noneffervescent; moderately alkaline, pH 8.2; gradual smooth boundary.

Ck—39 to 60 inches (99 to 152 cm); pale brown (10YR 6/3) clay loam, dark grayish brown (10YR 4/2), moist; 34 percent clay; massive; moderately hard, firm, moderately sticky, very plastic; few fine roots throughout; few fine irregular pores; common fine carbonate masses; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

Range in Characteristics

Aridic Ustorthents have properties that vary greater than family class limits.

C horizons
- Hue: 10YR, 2.5Y
- Value: 5 to 6 dry, 4 moist
- Chroma: 2 to 4, dry or moist
- Texture: sand, loamy coarse sand, loamy sand, sandy loam, fine sandy loam, silt loam, loam, clay loam, silty clay loam, clay
- Clay: 2 to 50 percent
- Reaction: slightly alkaline to moderately alkaline

Ck horizon
- Hue: 10YR, 2.5Y
- Value: 5 to 6 dry
- Chroma: 2 to 4, dry or moist
- Texture: sand, loamy coarse sand, loamy sand, sandy loam, fine sandy loam, silt loam, loam, clay loam, silty clay loam, clay
- Clay: 2 to 50 percent
- Reaction: slightly alkaline to moderately alkaline
- Calcium carbonate equivalent: 0 to 2 percent

Lindrith soils
Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Aridic Ustorthents
Geomorphic position: occurs on alluvial flats and terraces formed by arroyo cuts
Parent material: alluvium derived from sandstone and siltstone
Slope: 1 to 4 percent
Surface cover
- Biological crust

cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 65 percent
woody debris: 10 percent
bare soil: 25 percent
surface rock fragments

Drainage class: somewhat excessively drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity total inches: 6.3 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: B
Present vegetation: big sagebrush, black greasewood, blue grama, broom snakeweed, cheatgrass, fourwing saltbush, Indian ricegrass, prickly Russian thistle, prickly pear
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 21’ 11.50’’ north, 110° 3’ 46.50’’ west

A—0 to 4 inches (0 to 10 cm); grayish brown (10YR 5/2) fine sandy loam, dark yellowish brown (10YR 4/4), moist; 14 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; common medium, very fine, and fine roots throughout; common fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Ck—4 to 15 inches (10 to 38 cm); brown (10YR 5/3) loam, brown (10YR 4/3), moist; 15 percent clay; massive; slightly hard, very friable, slightly sticky, very plastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; common fine carbonate masses; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

C1—15 to 21 inches (38 to 53 cm); pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3), moist; 7 percent clay; massive; slightly hard, very friable, moderately sticky, nonplastic; common very fine and fine roots throughout; common fine irregular pores; 4 percent gravel; very slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C2—21 to 29 inches (53 to 74 cm); yellowish brown (10YR 5/4) loam, brown (10YR 4/3), moist; 14 percent clay; 40 percent very coarse prominent reddish yellow (5YR 6/8) mottles; massive; slightly hard, friable, moderately sticky, moderately plastic; common fine roots throughout; many very fine irregular pores and common very fine dendritic tubular pores; 4 percent gravel; slightly effervescent; moderately alkaline, pH 8.2; gradual smooth boundary.

C’k—29 to 47 inches (74 to 119 cm); yellowish brown (10YR 5/4) paragravelly sandy loam, brown (10YR 4/3), moist; 13 percent clay; massive; slightly hard, very friable, moderately sticky, slightly plastic; few fine roots throughout; few very fine dendritic tubular pores; common fine and few fine carbonate masses; 25 percent gravel; slightly

effervescent; 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

C—47 to 60 inches (119 to 152 cm); brown (10YR 5/3) loamy coarse sand, brown (10YR 4/3), moist; 4 percent clay; single grain; loose, loose, slightly sticky, nonplastic; few fine roots throughout; few fine irregular pores; noneffervescent; moderately alkaline, pH 8.0.

Range in Characteristics

A horizon
- Hue: 10YR, 2.5Y
- Value: 3 to 6 dry, 4 to 6 moist
- Chroma: 2 to 4, dry or moist
- Texture: sand, loamy coarse sand, loamy sand, loamy fine sand, sandy loam, fine sandy loam, loam, sandy clay loam, clay loam
- Clay: 2 to 34 percent
- Reaction: slightly alkaline to moderately alkaline

Ck horizons
- Hue: 10YR, 2.5Y
- Value: 3 to 6 dry, 4 to 6 moist
- Chroma: 2 to 4, dry or moist
- Texture: sand, loamy coarse sand, loamy sand, loamy fine sand, sandy loam, fine sandy loam, loam
- Clay: 2 to 18 percent
- Reaction: slightly alkaline to moderately alkaline
- Calcium carbonate equivalent: 0 to 2 percent
- Rock fragments: 0 to 25 percent

C horizons
- Hue: 10YR, 2.5Y
- Value: 3 to 6 dry, 4 to 6 moist
- Chroma: 2 to 4, dry or moist
- Texture: sand, loamy coarse sand, loamy sand, loamy fine sand, sandy loam, fine sandy loam, loam
- Clay: 2 to 18 percent
- Reaction: slightly alkaline to moderately alkaline

Some pedons have a massive C horizon at the surface rather than an A horizon.

Riverwash
Slope: 0 to 3 percent

Range in Characteristics

Riverwash miscellaneous areas consist of stream channels in the bottoms of deep arroyo cuts. Arroyo cuts typically form in alluvium derived from the Mesa Verde Group (Cretaceous-aged sandstones and siltstones) and range from 25 to 50 feet deep. Riverwash areas are typically barren but may have sparse vegetation growing along channel edges in sand and gravel bars.

8—Begay loam, 1 to 5 percent slopes

Map Unit Setting

Landform(s): terraces
Elevation: 6,300 to 6,900 feet (1,920 to 2,103 meters)

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to13.3 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush-Grasslands

Map Unit Composition

Begay and similar soils: 90 percent
Minor Components: 10 percent
- Atrac and similar soils
- Milok and similar soils
- Sodic Ustic Haplocambids with a coarse-loamy particle size class
- Ustic Torripsamments
- Soils similar to Begay with coarser and finer texture in the control section

Soil Properties and Qualities

Begay soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
Geomorphic position: deep, well-drained soils structural benches and terraces
Parent material: alluvium derived from sandstone
Slope: 1 to 5 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 25 percent
woody debris: 0 percent
bare soil: 75 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

Available water capacity total inches: 9.0 (high)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: A
Present vegetation: Russian thistle
Land capability (irrigated): 2c
Land capability (non irrigated): 6

Typical Profile

Location
Geographic Coordinate System: 36° 25’ 32.90’’ north, 109° 13’ 41.30’’ west

Ap—0 to 8 inches (0 to 20 cm); reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4), moist; 13 percent clay; moderate fine and medium subangular blocky structure;

slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots throughout; common very fine and fine dendritic tubular pores; violently effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

AB—8 to 20 inches (20 to 51 cm); reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4), moist; 14 percent clay; weak medium and coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine roots throughout; common fine dendritic tubular pores; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Bw1—20 to 32 inches (51 to 81 cm); reddish yellow (5YR 6/6) very fine sandy loam, yellowish red (5YR 4/6), moist; 7 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; interstitial pores; violently effervescent; strongly alkaline, pH 8.5; clear wavy boundary.

Bw2—32 to 45 inches (81 to 114 cm); reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4), moist; 10 percent clay; fine single grain structure; soft, very friable, nonsticky, nonplastic; interstitial pores; violently effervescent; strongly alkaline, pH 8.7; clear wavy boundary.

BC—45 to 60 inches (114 to 152 cm); reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4), moist; 11 percent clay; massive and weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; very slightly effervescent; strongly alkaline, pH 8.8.

Range in Characteristics

Ap horizon
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: loam, fine sandy loam, very fine sandy loam, silt loam, sandy clay loam, sandy loam, loamy fine sand
- Clay: 6 to 22 percent
- Reaction: slightly alkaline to strongly alkaline

AB horizon
- Hue: 5YR
- Value: 4 or 5, dry or moist
- Chroma: 4 dry or moist
- Texture: loam, fine sandy loam
- Clay: 14 to 15 percent
- Reaction: moderately alkaline to strongly alkaline

Bw horizons
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 6 moist
- Chroma: 3 to 6, dry or moist
- Texture: loam, fine sandy loam, very fine sandy loam, silt loam, sandy loam, loamy fine sand, gravelly fine sandy loam
- Clay: 4 to 22 percent
- Reaction: moderately alkaline to strongly alkaline

BC horizon
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 3 to 8, dry or moist

Texture: loam, sand, fine sand, loamy sand, sandy loam, fine sandy loam, very fine sandy loam
Clay: 4 to 25 percent
Reaction: moderately alkaline to strongly alkaline

Cambic horizon – the zone from 20 to32 inches (Bw and BC horizons).

Some pedons have an Ab horizon.
Some pedons have a Bn horizon.
Some pedons have a Bk horizon that is not calcic.
Some pedons have a C horizon.
Some pedons have a Cn horizon that is strongly alkaline.

9—Begay-Gullied land complex, sodic, 1 to 3 percent slopes

Map Unit Setting

Landform(s): channels, terraces
Elevation: 6,100 to 6,500 feet (1,859 to 1,981 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush – Grasslands

Map Unit Composition

Begay and similar soils: 45 percent
Gullied land: 40 percent
Minor Components: 15 percent
- Atrac and similar soils
- Riverwash
- Soils similar to Begay with finer textures in the control section

Soil Properties and Qualities

Begay soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
Geomorphic position: occurs on terraces and structural benches along narrow canyons that are dissected by arroyo cuts
Parent material: eolian deposits derived from sandstone over slope alluvium derived from sandstone
Slope: 1 to 3 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 40 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 20 percent

woody debris: 5 percent
bare soil: 32 percent
surface rock fragments
gravel: 2 percent
cobble: 1 percent

Drainage class: well drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

Available water capacity total inches: 7.2 (high)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: A
Present vegetation: alkali sacaton, Douglas rabbitbrush, greasewood, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 25’ 17.00’’ north, 109° 14’ 38.10’’ west

An—0 to 9 inches (0 to 23 cm); reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 5/6), moist; 9 percent clay; moderate medium subangular blocky and moderate very thick platy structure; hard, firm, slightly sticky, slightly plastic; common medium, very fine, and fine roots throughout; common very fine dendritic tubular pores; strongly effervescent; very strongly alkaline, pH 9.2; clear wavy boundary.

Bn1—9 to 17 inches (23 to 43 cm); light reddish brown (5YR 6/4) fine sandy loam, yellowish red (5YR 5/6), moist; 8 percent clay; weak coarse subangular blocky parts to moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common medium and fine roots throughout; common very fine dendritic tubular pores; strongly effervescent; very strongly alkaline, pH 9.2; clear smooth boundary.

Bn2—17 to 33 inches (43 to 84 cm); reddish yellow (5YR 6/8) fine sandy loam, yellowish red (5YR 5/6), moist; 11 percent clay; weak medium subangular blocky parts to weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; few medium roots throughout; violently effervescent; very strongly alkaline, pH 9.4; gradual wavy boundary.

Cn—33 to 60 inches (84 to 152 cm); reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 5/8), moist; 14 percent clay; massive; slightly hard, firm, slightly sticky, slightly plastic; few medium and fine roots throughout; strongly effervescent; very strongly alkaline, pH 9.4.

Range in Characteristics

Clay content of the control section (weighted average): 10 to 18 percent

An horizon
Hue: 5YR, 7.5YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 4 to 6, dry or moist
Texture: fine sandy loam, loamy fine sand
Clay: 6 to 11 percent
Reaction: strongly alkaline to very strongly alkaline
Sodium adsorption ratio: 5 to 12

Bn horizons
Hue: 5YR, 7.5YR
Value: 4 to 6, dry or moist
Chroma: 4 to 8, dry or moist
Texture: loamy fine sand, fine sandy loam, very fine sandy loam
Clay: 7 to 25 percent
Sodium adsorption ratio: 5 to 12

Cn horizon
Hue: 5YR, 7.5YR
Value: 4 to 6, dry or moist
Chroma: 4 to 8, dry or moist
Texture: loamy fine sand, fine sandy loam, very fine sandy loam
Clay: 7 to 25 percent
Sodium adsorption ratio: 5 to 12

Cambic horizon – the zone from 9 to 33 inches (Bn2 horizon).

Gullied land

Range in Characteristics

Consists of areas where erosion has cut a network of V-shaped or U-shaped channels. The areas resemble miniature badlands. Generally, gullies are so deep that extensive reshaping is necessary for most uses. Small areas can be shown by spot symbols. Phases that indicate the kind of material remaining may be useful for some areas.

10—Begay-Mido complex, 1 to 15 percent slopes

Map Unit Setting

Landform(s): fan remnants, structural benches
Elevation: 5,880 to 6,200 feet (1,792 to 1,889 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to13.3 degrees C)
Frost-free period: 135 to165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush – Grasslands

Map Unit Composition

Begay and similar soils: 75 percent
Mido and similar soils: 20 percent
Minor Components: 5 percent
- Lithic Torriorthents
- Nakai series
- Riverwash
- Gullied land
- Active dunes and sandsheets

Soil Properties and Qualities

Begay soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
Geomorphic position: occurs on structural benches

Parent material: eolian sands derived from sandstone over slope alluvium derived from sandstone
Slope: 1 to 15 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 15 percent
woody debris: 5 percent
bare soil: 80 percent
surface rock fragments

Drainage class: somewhat excessively drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

Available water capacity total inches: 6.1 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: A
Present vegetation: blue grama, blue grama, broom snakeweed, Cutler Mormon tea, fourwing saltbush, galleta, Indian ricegrass, needle and thread, Russian thistle, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 36’ 35.80’’ north, 109° 20’ 46.50’’ west

A—0 to 3 inches (0 to 8 cm); yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6), moist; 12 percent clay; weak thin platy parts to weak fine granular structure; soft, very friable, nonsticky, nonplastic; many fine roots throughout; many fine vesicular pores; slightly effervescent; moderately alkaline, pH 8.3; clear smooth boundary.

Bw—3 to 18 inches (8 to 46 cm); yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6), moist; 15 percent clay; moderate fine subangular blocky and moderate medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; many fine roots throughout; many fine tubular pores; strongly effervescent; strongly alkaline, pH 8.5; clear wavy boundary.

C—18 to 60 inches (46 to 152 cm); yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 5/6), moist; 12 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; common fine roots throughout; many fine tubular pores; violently effervescent; strongly alkaline, pH 8.6.

Range in Characteristics

Clay content of the control section (weighted average): 12 to 18 percent

A horizon
Hue: 5YR
Value: 5 to 6 dry or moist

Chroma: 6 to 8 dry, 4 to 6 moist
Texture: loamy fine sand, loamy very fine sand, fine sandy loam, and very fine sandy loam
Clay: 5 to 12 percent

Bw horizon
Hue: 5YR
Value: 5 to 6 dry, 4 to 5 moist
Chroma: 4 to 8 dry, 6 to 8 moist
Texture: loamy fine sand, loamy very fine sand, fine sandy loam, and very fine sandy loam
Clay: 5 to 18 percent

C horizon
Hue; 5YR
Value: 5 to 6 dry, 4 to 5 moist
Chroma: 6 to 8 dry or moist
Texture: loamy fine sand, fine sandy loam, and very fine sandy loam
Clay: 8 to 18 percent

Cambic horizon – the zone from 3 to 18 inches (Bw horizon).

Mido soils
Taxonomic classification: Mixed, mesic Ustic Torripsamments
Geomorphic position: occurs on structural benches
Parent material: eolian sands derived from sandstone
Slope: 2 to 10 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 40 percent
woody debris: 1 percent
bare soil: 59 percent
surface rock fragments

Drainage class: excessively drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

Available water capacity total inches: 6.0 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: A
Present vegetation: blue grama, broom snakeweed, cheatgrass, Fendler threeawn, fourwing saltbush, Greene rabbitbrush, Indian ricegrass, needle and thread, Russian thistle, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 36’ 23.50’’ north, 109° 21’ 19.10’’ west

A—0 to 3 inches (0 to 8 cm); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6), moist; 7 percent clay; moderate very fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots throughout; many very fine and fine vesicular pores; very slightly effervescent; moderately alkaline, pH 8.3; clear smooth boundary.

C1—3 to 19 inches (8 to 48 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/6), moist; 8 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common medium, coarse, very fine, and fine roots throughout; many very fine and fine tubular pores; strongly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

C2—19 to 41 inches (48 to 104 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/6), moist; 8 percent clay; weak fine subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common medium and coarse roots throughout; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Ck—41 to 60 inches (104 to 152 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/6), moist; 7 percent clay; massive; soft, very friable, nonsticky, nonplastic; common medium roots throughout; many very fine and fine tubular pores; few fine carbonate masses; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon
- Hue: 5YR
- Value: 4 to 5 dry or moist
- Chroma: 6 dry or moist
- Texture: loamy fine sand, loamy very fine sand
- Clay: 5 to 10 percent

C horizons
- Hue: 5YR
- Value: 5 to 6 dry or moist
- Texture: loamy fine sand
- Chroma: 6 dry or moist
- Clay: 5 to 8 percent

Ck horizon
- Hue: 5YR
- Value: 5 to 6 dry or moist
- Chroma: 6 to 8 dry or moist
- Texture: loamy fine sand, loamy very fine sand
- Clay: 4 to 12 percent

11—Begay-Querencia-Rizno complex, 1 to 10 percent slopes

Map Unit Setting

Landform(s): alluvial flats, stream terraces
Elevation: 6,200 to 6,400 feet (1,890 to 1,951 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)

Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush – Grasslands

Map Unit Composition

Begay and similar soils: 45 percent
Querencia and similar soils: 35 percent
Rizno and similar soils: 15 percent
Minor Components: 5 percent
- Reef and similar soils
- Soils similar to Farview and Begay that have greater than 35 percent rock fragments in the control section
- Rock outcrop
- Soils similar to Rizno that have greater than 18 percent clay in the control section
- Soils similar to Querencia with coarser and finer textures in the control section

Soil Properties and Qualities

Begay soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
Geomorphic position: occurs on alluvial flats and stream terraces
Parent material: slope alluvium derived from sandstone and shale and/or eolian sands derived from sandstone and shale
Slope: 1 to 4 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 5 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 40 percent
woody debris: 10 percent
bare soil: 45 percent
surface rock fragments

Drainage class: somewhat excessively drained
Ksat solum: 0.57 to 19.98 inches per hour (4.00 to 141.00 micrometers per second)

Available water capacity total inches: 6.9 (moderate)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: very low
Hydrologic group: B
Present vegetation: blue grama, broom snakeweed, cheatgrass, Colorado pinyon, galleta, Opuntia, Utah juniper, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 6’ 5.70’’ north, 110° 15’ 7.50’’ west

A—0 to 3 inches (0 to 8 cm); brown (7.5YR 4/4) sandy loam, brown (7.5YR 4/3), moist; 12 percent clay; moderate very thick platy structure; soft, very friable, nonsticky, nonplastic; common fine roots throughout; few fine irregular pores; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw1—3 to 14 inches (8 to 36 cm); brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 5/4), moist; 22 percent clay; weak medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; common very fine and fine roots throughout; few fine irregular pores; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bw2—14 to 21 inches (36 to 53 cm); brown (7.5YR 4/4) fine sandy loam, brown (7.5YR 4/3), moist; 16 percent clay; weak medium subangular blocky structure; slightly hard, firm, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine tubular pores; slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

2Ck—21 to 60 inches (53 to 152 cm); yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4), moist; 12 percent clay; weak medium angular blocky structure; slightly hard, firm, nonsticky, nonplastic; few very fine and fine roots throughout; common very fine tubular pores; common fine carbonate masses; violently effervescent, 4 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; gradual wavy boundary.

Range in Characteristics

Clay content of the control section (weighted average): 10 to 18 percent

A horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: loamy fine sand, sandy loam, fine sandy loam
- Clay: 7 to 16 percent
- Reaction: moderately alkaline

Bw horizons
- Hue: 5YR, 7.5YR, 10YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: loamy fine sand, sandy loam, fine sandy loam, sandy clay loam
- Clay: 7 to 22 percent
- Reaction: moderately alkaline to strongly alkaline
- Rock fragments: 5 to 14 percent

2Ck horizon
- Hue: 7.5YR, 10YR
- Value: 5 to 7 dry, 4 to 6 moist
- Chroma: 4 to 6, dry or moist
- Texture: sand, loamy sand, loamy fine sand, sandy loam
- Clay: 7 to 16 percent
- Reaction: moderately alkaline to strongly alkaline
- Rock fragments: 10 to 15 percent
- Calcium carbonate equivalent: 1 to 4 percent

Cambic horizon – the zone from 3 to 21 inches (Bw horizons).

Querencia soils
Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocambids
Geomorphic position: occurs on alluvial flats and stream terraces

Parent material: slope alluvium derived from sandstone and shale, and/or eolian sands derived from sandstone and shale over residuum weathered from sandstone and shale
Slope: 1 to 3 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 5 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 70 percent
woody debris: 10 percent
bare soil: 20 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 19.98 inches per hour (1.40 to 141.00 micrometers per second)

Available water capacity total inches: 9.4 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: medium
Hydrologic group: C
Present vegetation: blue grama, broom snakeweed, buckwheat, cheatgrass, Colorado pinyon, crested wheatgrass, fourwing saltbush, galleta, prickly Russian thistle, Stansbury cliffrose, Utah juniper, winterfat, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 5’ 44.80” north, 110° 14’ 51.30” west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) loam, brown (7.5YR 4/2), moist; 24 percent clay; granular structure; soft, very friable, slightly sticky, slightly plastic; common medium and fine roots throughout; common very fine irregular pores; noneffervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

Bw1—2 to 12 inches (5 to 30 cm); brown (7.5YR 4/4) loamy sand, dark brown (7.5YR 3/4), moist; 9 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots throughout; common very fine irregular pores; noneffervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

Bw2—12 to 20 inches (30 to 51 cm); brown (7.5YR 5/3) sandy clay loam, brown (7.5YR 4/3), moist; 21 percent clay; weak medium subangular blocky structure; moderately hard, friable, slightly sticky, slightly plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; noneffervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

Bk1—20 to 31 inches (51 to 79 cm); brown (7.5YR 5/3) sandy clay loam, brown (7.5YR 4/3), moist; 22 percent clay; prismatic structure; hard, firm, slightly sticky, slightly plastic; few coarse, very fine, and fine roots throughout; common very fine and fine dendritic tubular pores; common fine carbonate masses; slightly effervescent,

2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Bk2—31 to 46 inches (79 to 117 cm); brown (7.5YR 4/3) sandy clay loam, dark brown (7.5YR 3/3), moist; 24 percent clay; prismatic structure; hard, firm, slightly sticky, slightly plastic; few very fine and fine roots throughout; common very fine and fine dendritic tubular pores; common fine carbonate masses; strongly effervescent, 5 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt wavy boundary.

BC—46 to 62 inches (117 to 157 cm); yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4), moist; 21 percent clay; weak medium angular blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine roots throughout; common very fine and fine vesicular pores; few fine carbonate masses; slightly effervescent; strongly alkaline, pH 8.6.

Range in Characteristics

Clay content of the control section (weighted average): 18 to 32 percent

A horizon
- Hue: 7.5YR, 10YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 2 to 4, dry or moist
- Texture: fine sandy loam, sandy clay loam, loam
- Clay: 6 to 24 percent
- Reaction: moderately alkaline to strongly alkaline

Bw horizons
- Hue: 7.5YR, 10YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 2 to 4, dry or moist
- Texture: sandy clay loam, silty clay loam, clay loam
- Clay: 9 to 32 percent
- Reaction: moderately alkaline to strongly alkaline

Bk horizons
- Hue: 7.5YR, 10YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 1 to 4, dry or moist
- Texture: sandy clay loam, silty clay loam, clay loam
- Clay: 9 to 32 percent
- Reaction: moderately alkaline to strongly alkaline
- Calcium carbonate equivalent: 1 to 10 percent

BC horizon
- Hue: 7.5YR, 10YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 3 to 4, dry or moist
- Texture: sandy clay loam, loam, clay loam
- Clay: 5 to 30 percent
- Reaction: moderately alkaline to strongly alkaline
- Rock fragments: 0 to 10 percent

Cambic horizon – the zone from 12 to 46 inches (Bw horizons).

Identifiable secondary carbonate – the zone from 20 to 62 inches.

Rizno soils

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents

Geomorphic position: occurs on hills and ridges
Parent material: slope alluvium derived from sandstone and shale and/or eolian sands derived from sandstone and shale over residuum weathered from sandstone and shale
Slope: 2 to 10 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 5 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 50 percent
woody debris: 10 percent
bare soil: 40 percent
surface rock fragments

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: moderately well drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 1.0 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: very low
Hydrologic group: D
Present vegetation: Anderson wolfberry, blue grama, broom snakeweed, cheatgrass, Colorado pinyon, galleta, Opuntia, Stansbury cliffrose, Utah juniper, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 6’ 12.90’’ north, 110° 15’ 12.90’’ west

A—0 to 1 inch (0 to 3 cm); dark brown (7.5YR 3/3) sandy loam, brown (7.5YR 4/3), moist; 16 percent clay; very thick platy structure; soft, very friable, nonsticky, nonplastic; common coarse and common fine roots throughout; irregular pores; very slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C—1 to 9 inches (3 to 23 cm); dark brown (7.5YR 3/3) sandy loam, brown (7.5YR 4/3), moist; 16 percent clay; medium platy structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; irregular pores; 5 percent channer; slightly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

R—9 inches (23 cm) weathered, unfractured sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 0 to 15 percent

A horizon
Hue: 5YR, 7.5YR, 10YR
Value: 3 to 6 dry, 4 to 5 moist

Chroma: 3to 4, dry or moist
Texture: loamy sand, loamy fine sand, sandy loam, loam, Clay: 7 to 30 percent
Rock fragments: 0 to 14 percent

C horizon
Hue: 5YR, 7.5YR, 10YR
Value: 5 to 6 dry, 4 to 5 moist
Chroma: 3 to 4, dry or moist
Texture: loamy sand, loamy fine sand, sandy loam, loam, sandy clay loam
Clay: 7 to 34 percent
Rock fragments: 0 to 15 percent

12—Chromic Haplotorrerts-Gotho complex, 0 to 4 percent slopes

Map Unit Setting

Landform(s): alluvial flats, basin-floor remnants, terraces
Elevation: 5,500 to 6,900 feet (1,676 to 2,103 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Chromic Haplotorrerts and similar soils: 50 percent
Gotho and similar soils: 40 percent
Minor components: 10 percent
- Aneth
- Gullied land
- River wash
- Soils similar to Gotho with finer textures in the control section

Soil Properties and Qualities

Chromic Haplotorrerts soils
Taxonomic classification: Chromic Haplotorrerts
Geomorphic position: occurs on relic basin floors and alluvial flats
Parent material: alluvium derived from sandstone
Slope: 0 to 4 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 30 percent
woody debris: 5 percent
bare soil: 65 percent
surface rock fragments

Drainage class: moderately well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 8.7 (high)
Shrink-swell potential: about 10.5 LEP (very high)
Flooding hazard: very rare
Runoff class: medium
Hydrologic group: C
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 1’ 40.60’’ north, 109° 40’ 35.60’’ west

A—0 to 2 inches (0 to 5 cm); yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4), moist; 14 percent clay; weak medium platy parts to moderate fine granular structure; soft, very friable, moderately sticky, moderately plastic; common very fine roots throughout; common very fine vesicular and common very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C—2 to 10 inches (5 to 25 cm); brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4), moist; 38 percent clay; moderate fine prismatic parts to moderate medium subangular blocky and moderate fine prismatic parts to moderate fine subangular blocky structure; slightly hard, friable, very sticky, very plastic; many very fine and common fine roots throughout; common very fine tubular pores; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Css—10 to 34 inches (25 to 86 cm); brown (7.5YR 5/4) clay, brown (7.5YR 4/4), moist; 42 percent clay; strong coarse angular blocky and strong medium angular blocky and weak medium wedge structure; very hard, very firm, very sticky, very plastic; common very fine roots throughout; common very fine tubular pores; common distinct brown (7.5YR 4/4), dry, pressure faces on all faces of peds and common distinct brown (7.5YR 4/4), dry, slickensides (pedogenic) on all faces of peds; strongly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Ckss—34 to 44 inches (86 to 112 cm); yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4), moist; 41 percent clay; strong fine angular blocky and strong medium angular blocky structure; very hard, very firm, very sticky, very plastic; few very fine roots throughout; common very fine and fine tubular pores; common distinct dark yellowish brown (10YR 4/4), dry, pressure faces on all faces of peds; common fine and medium carbonate masses and common medium salt masses; strongly effervescent, 8 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Ck—44 to 60 inches (112 to 152 cm); yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4), moist; 16 percent clay; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; common very fine irregular pores; common fine and medium carbonate masses,common medium salt masses; strongly effervescent, 7 percent calcium carbonate equivalent; slightly alkaline, pH 7.8.

Range in Characteristics

Chromic Haplotorrerts have soil properties that vary greater than family class limits.

Clay content of the control section (weighted average): 15 to 50 percent

A horizon
Hue: 7.5YR, 5YR, 10YR, 2.5Y

Value: 5 to 6 dry, 4 moist
Chroma: 4 dry or moist
Texture: sandy loam, sandy clay loam, clay loam, clay
Clay: 12 to 50 percent
Reaction: moderately alkaline to strongly alkaline

C horizon
Hue: 5YR, 7.5YR, 10YR, 2.5Y
Value: 5 to 6 dry, 4 moist
Chroma: 4 dry or moist
Texture: sandy clay loam, clay loam, clay
Clay: 30 to 50 percent
Reaction: moderately alkaline to strongly alkaline

Css horizon
Hue: 5YR, 7.5YR, 10YR, 2.5Y
Value: 4 to 5, dry or moist
Chroma: 3 or4, dry or moist
Texture: sandy clay loam, clay loam, clay
Clay: 30 to 50 percent
Reaction: slightly alkaline to strongly alkaline

Ckss horizon
Hue: 5YR, 7.5YR, 10YR, 2.5Y
Value: 4 to 5, dry or moist
Chroma: 3 to 4, dry or moist
Texture: sandy clay loam, clay loam, clay
Clay: 30 to 50 percent
Reaction: slightly alkaline to strongly alkaline
Calcium carbonate equivalent: 5 to 10 percent

Ck horizon
Hue: 5YR, 7.5YR, 10YR, 2.5Y
Value: 4 to 5, dry or moist
Chroma: 3 to 6, dry or moist
Texture: fine sandy loam, sandy clay loam, clay loam, clay
Clay: 15 to 50 percent
Reaction: slightly alkaline to strongly alkaline
Calcium carbonate equivalent: 5 to 10 percent

Soil cracks: many vertical cracks 0.25 to 0.75 inches wide from the surface to 45 inches

Gotho soils
Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents
Geomorphic position: occurs on relic alluvial flats and terraces
Parent material: alluvium derived from sandstone
Slope: 0 to 4 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent

Physical cover
canopy plant cover: 30 percent
woody debris: 5 percent
bare soil: 65 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 10.2 (very high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: very rare
Runoff class: low
Hydrologic group: C
Present vegetation: Russian thistle
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 1’ 40.06” north, 109° 40’ 35.80” west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) fine sandy loam, brown (7.5YR 4/3), moist; 17 percent clay; moderate thick platy parts to weak fine granular structure; soft, friable, moderately sticky, moderately plastic; common very fine and fine roots throughout; common very fine vesicular and common fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Ck1—2 to 17 inches (5 to 43 cm); pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3), moist; 32 percent clay; moderate very fine and fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; many fine carbonate masses; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Ck2—17 to 29 inches (43 to 74 cm); grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2), moist; 30 percent clay; moderate fine and medium subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots throughout; common very fine and fine tubular pores; common fine carbonate masses; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C—29 to 56 inches (74 to 142 cm); yellowish brown (10YR 5/4) sandy clay loam, brown (10YR 5/3), moist; 22 percent clay; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots throughout; common very fine tubular pores; very slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Cky—56 to 60 inches (142 to 152 cm); pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3), moist; 30 percent clay; moderate thick platy structure; hard, firm, moderately sticky, moderately plastic; common very fine roots throughout; common very fine irregular pores; common fine carbonate masses and few fine gypsum crystals; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

Range in Characteristics

A horizon
Hue: 5YR, 7.5YR, 10YR

Value: 5 to 6 dry, 4 moist
Chroma: 3 to 4 dry, 3 moist
Texture: sandy loam, fine sandy loam, loam, sandy clay loam, clay loam, clay
Clay: 17 to 50 percent
Reaction: moderately alkaline to strongly alkaline

Ck horizons
Hue: 5YR, 7.5YR, 10YR, 2.5Y
Value: 5 to 6 dry, 4 to 5 moist
Chroma: 2 to 6 dry, 2 to 3 moist
Texture: sandy loam, loam, sandy clay loam, clay loam, clay
Clay: 18 to 35 percent
Reaction: moderately alkaline to strongly alkaline
Calcium carbonate equivalent: 5 to 10 percent

C horizon
Hue: 5YR, 7.5YR, 10YR, 2.5Y
Value: 5 to 6, dry or moist
Chroma: 3 to 6, dry or moist
Texture: loamy sand, sandy loam, sandy clay loam, clay loam
Clay: 18 to 35 percent
Reaction: moderately alkaline to strongly alkaline

Cky horizon
Hue: 5YR, 7.5YR, 10YR, 2.5Y
Value: 5 to 6, dry or moist
Chroma: 2 to 6, dry or moist
Texture: loamy sand, sandy loam, sandy clay loam, clay loam
Clay: 18 to 35 percent
Reaction: moderately alkaline to strongly alkaline
Calcium carbonate equivalent: 5 to 10 percent
Gypsum: 0 to 2 percent

13—Claysprings-Lithic Torriorthents-Typic Torriorthents complex, badlands, 1 to 60 percent slopes

Map Unit Setting

Landform(s): escarpments, hills, structural benches
Elevation: 5,300 to 6,100 feet (1,615 to 1,859 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Claysprings and similar soils: 45 percent
Lithic Torriorthents and similar soils: 25 percent
Typic Torriorthents and similar soils: 20 percent
Minor Components: 10 percent
- Needle and similar soils
- Sheppard and similar soils
- Badlands

- Gullied land
- Riverwash
- Rock outcrop

Soil Properties and Qualities

Claysprings soils
Taxonomic classification: Clayey, mixed, superactive, calcareous, mesic, shallow Typic Torriorthents
Geomorphic position: occurs on structural benches, escarpments, and side slopes of hills
Parent material: residuum weathered from sandstone and shale
Slope: 1 to 60 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 5 percent
woody debris: 0 percent
bare soil: 85 percent
surface rock fragments
gravel: 10 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, densic
Drainage class: somewhat poorly drained
Ksat solum: 0.00 to 0.57 inches per hour (0.00 to 4.00 micrometers per second)

Available water capacity total inches: 1.3 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: high
Hydrologic group: D
Present vegetation: alkali sacaton, mound saltbush, shadscale saltbush
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 35° 55’ 26.60’’ north, 109° 32’ 26.10’’ west

C1—0 to 2 inches (0 to 5 cm); gray (10YR 6/1) clay, dark gray (10YR 4/1), moist; 40 percent clay; moderate thin platy parts to moderate fine granular structure; slightly hard, friable, very sticky, very plastic; common very fine roots throughout; many very fine irregular pores; noneffervescent; strongly alkaline, pH 8.6; gradual wavy boundary.

C2—2 to 7 inches (5 to 18 cm); gray (10YR 6/1) silty clay loam, gray (10YR 6/1), moist; 37 percent clay; very hard, friable, very sticky, moderately plastic; many very fine and common fine roots throughout; common very fine irregular pores; noneffervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Cd—7 to 17 inches (18 to 43 cm); light gray (10YR 7/1) clay loam, gray (10YR 5/1), moist; 32 percent clay; very rigid, extremely firm, moderately sticky, slightly plastic; many very fine roots top of horizon; noneffervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Claysprings as used in this survey is a taxadjunct to the series because it has a mixed mineralogy class, a superactive cation exchange activity class, and is non acid. Claysprings series is a Clayey, smectitic, calcareous, mesic, shallow Typic Torriorthents.

C horizons
- Hue: 5YR, 7.5YR, 10YR
- Value: 4 to 7 dry, 3 to 6 moist
- Chroma: 1 to 6, dry or moist
- Texture: sandy clay loam, clay loam, silty clay loam, sandy clay, clay, silty clay
- Clay: 30 to 50 percent
- Reaction: moderately alkaline to strongly alkaline

Cd horizon
- Hue: 5YR, 7.5YR, 10YR
- Value: 3 to 7, dry or moist
- Chroma: 1 to 6, dry or moist
- Texture: sandy clay loam, clay loam, silty clay loam
- Clay: 25 to 35 percent
- Reaction: moderately alkaline to strongly alkaline

Some pedons have pararock fragments in excess of 35 percent.
Some pedons have a thin Cr horizon.
Some pedons have a Cn horizon that is strongly alkaline.

Lithic Torriorthents soils
Taxonomic classification: Lithic Torriorthents
Geomorphic position: occurs on structural benches
Parent material: residuum weathered from sandstone
Slope: 2 to 60 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 5 percent
  - woody debris: 0 percent
  - bare soil: 60 percent
- surface rock fragments
  - gravel: 35 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: somewhat poorly drained
Ksat solum: 0.20 to 0.57 inches per hour (1.40 to 4.00 micrometers per second)
Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 0.8 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: medium
Hydrologic group: D

Present vegetation: alkali sacaton, broom snakeweed, rubber rabbitbrush, shadscale saltbush
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 35° 55’ 9.70’’ north, 109° 36’ 6.07’’ west

C—0 to 6 inches (0 to 15 cm); yellowish red (5YR 5/6) gravelly sandy loam, yellowish red (5YR 4/6), moist; 15 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; common very fine roots throughout; common very fine and fine dendritic tubular pores; 20 percent gravel and 5 percent cobble; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

R—6 inches (15 cm); unweathered, fractured sandstone bedrock.

Range in Characteristics

Lithic Torriorthents have soil properties that vary greater than family class limits.

C horizon
- Hue: 7.5YR, 5YR, 2.5YR, 2.5Y
- Value: 4 to 7 dry
- Chroma: 1 to 8 dry, 4 to 6 moist
- Texture: fine sand, loamy fine sand, sandy loam, silt loam, sandy clay loam, clay loam, sandy clay, clay
- Clay: 3 to 50 percent
- Reaction: moderately alkaline to strongly alkaline
- Rock fragments: 0 to 35 percent

Some pedons have a thin Cr horizon.
Some pedons have a Cn horizon that is strongly alkaline.

Typic Torriorthents soils
Taxonomic classification: Typic Torriorthents
Geomorphic position: occurs on structural benches
Parent material: alluvium derived from sandstone and/or residuum weathered from sandstone
Slope: 1 to 20 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 5 percent
  - woody debris: 0 percent
  - bare soil: 70 percent
- surface rock fragments
  - gravel: 15 percent
  - cobble: 5 percent
  - stone: 5 percent

Drainage class: moderately well drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

Available water capacity total inches: 4.4 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none

Runoff class: low
Hydrologic group: A
Present vegetation: fourwing saltbush, galleta, rubber rabbitbrush

Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 12’ 4.80” north, 109° 37’ 54.20” west

C1—0 to 2 inches (0 to 5 cm); strong brown (7.5YR 5/6) loamy coarse sand, brown (7.5YR 5/4), moist; 8 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; many fine vesicular pores; 5 percent gravel; violently effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C2—2 to 10 inches (5 to 25 cm); strong brown (7.5YR 5/6) sandy loam, brown (7.5YR 5/4), moist; 10 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; many fine vesicular pores; 5 percent gravel; violently effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C3—10 to 26 inches (25 to 66 cm); light brown (7.5YR 6/4) gravelly loamy coarse sand, brown (7.5YR 5/4), moist; 5 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; many fine vesicular pores; 20 percent gravel; violently effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

C4—26 to 30 inches (66 to 76 cm); light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4), moist; 22 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; common fine roots throughout; common fine vesicular pores; 5 percent gravel; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

C5—30 to 60 inches (76 to 152 cm); light brown (7.5YR 6/4) coarse sand, brown (7.5YR 5/4), moist; 4 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; many fine vesicular pores; 5 percent gravel; violently effervescent; strongly alkaline, pH 8.6.

Range in Characteristics

Typic Torriorthents have soil properties that vary greater than family class limits.

C horizons
- Hue: 5YR, 7.5YR
- Value: 4 to 7 dry, dry or moist
- Chroma: 2 to 6 dry, 3 to 4 moist
- Texture: coarse sand, loamy coarse sand, loamy sand, coarse sandy loam, sandy loam, loam, sandy clay loam, sandy clay, clay
- Clay: 2 to 50 percent
- Reaction: moderately alkaline to strongly alkaline
- Rock fragments: 0 to 35 percent

Some pedons have a Cn horizon that is strongly alkaline.

14—Councelor-Moclom-Hawaikuh complex, 1 to 60 percent slopes

Map Unit Setting

Landform(s): fan remnants, mesas
Elevation: 5,800 to 6,100 feet (1,768 to 1,859 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to13.3 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush – Grasslands

Map Unit Composition

Councelor and similar soils: 40 percent
Moclom and similar soils: 35 percent
Hawaikuh and similar soils: 10 percent
Minor Components: 15 percent
- Pensom and similar soils
- Arches and similar soils
- Rock outcrop
- Gullied land
- Councelor and similar soils that have finer textures in the particle size control section

Map unit originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Soil Properties and Qualities

Councelor soils
Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torriorthents
Geomorphic position: occurs on stream terraces and stabilized sand sheets on fan remnants
Parent material: residuum weathered from sandstone and/or eolian sands derived from sandstone and shale
Slope: 1 to30 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 20 percent
    woody debris: 3 percent
    bare soil: 60 percent
  surface rock fragments
    gravel: 10 percent
    cobble: 5 percent
    stone: 2 percent

Drainage class: excessively drained
Ksat solum: 0.20 to 19.98 inches per hour (1.40 to 141.00 micrometers per second)

Available water capacity total inches: 5.7 (moderate)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: C
Present vegetation: blue grama, broom snakeweed, pinyon, Utah juniper, yucca
Land capability (non irrigated): 7c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 39’ 22.90’’ north, 110° 12’ 50.60’’ west

Ck1—0 to 2 inches (0 to 5 cm); light brown (7.5YR 6/4) sand, brown (7.5YR 5/4), moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; few very fine and fine roots throughout; few medium carbonate masses; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Ck2—2 to 8 inches (5 to 20 cm); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4), moist; 14 percent clay; massive; loose, loose, slightly sticky, nonplastic; common medium roots, few coarse and very coarse roots, and common very fine and fine roots throughout; common medium dendritic, few coarse and very coarse dendritic, and common very fine and fine dendritic tubular pores; few medium carbonate masses; 2 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

Ck3—8 to 13 inches (20 to 33 cm); brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4), moist; 20 percent clay; massive; soft, very friable, nonsticky, nonplastic; common medium roots, few coarse roots, common very fine and fine roots throughout; common medium dendritic, few coarse dendritic, and common very fine and fine dendritic tubular pores; common coarse carbonate nodules; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

Ck4—13 to 44 inches (33 to 112 cm); brown (7.5YR 5/4) sandy loam, strong brown (7.5YR 4/6), moist; 17 percent clay; massive; moderately hard, friable, nonsticky, nonplastic; few very fine and fine roots throughout; few very fine and fine dendritic tubular pores; common coarse carbonate nodules; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; gradual wavy boundary.

Ck5—44 to 60 inches (112 to 152 cm); strong brown (7.5YR 5/6) loamy sand, strong brown (7.5YR 4/6), moist; 6 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots throughout; few very fine dendritic tubular pores; few medium carbonate masses; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

Range in Characteristics

Ck horizons
- Hue: 5YR, 7.5YR, 10YR
- Value: 4 to 7 dry, 4 or 6 moist
- Chroma: 2 to 6 dry, 4 or 6 moist

Texture: sand, fine sand, loamy sand, sandy loam, fine sandy loam, loam, sandy clay loam
Clay: 2 to18 percent
Reaction: moderately alkaline to strongly alkaline
Calcium carbonate equivalent: 1 to 4 percent

Moclom soils
Taxonomic classification: Mixed, mesic Lithic Torripsamments
Geomorphic position: occurs on ledges of mesa escarpments
Parent material: eolian sands derived from sandstone
Slope: 1 to 60 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 25 percent
woody debris: 2 percent
bare soil: 50 percent
surface rock fragments
gravel: 20 percent
cobble: 2 percent
stone: 1 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: excessively drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 1.3 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: D
Present vegetation: Indian ricegrass, pinyon, Utah juniper, yucca
Land capability (non irrigated): 7c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 38’ 54.30’’ north, 110° 12’ 57.30’’ west

C—0 to 4 inches (0 to 10 cm); light yellowish brown (2.5Y 6/4) sand, light olive brown (2.5Y 5/4), moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; few medium, very fine, and fine roots throughout; 1 percent gravel; violently effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Ck—4 to 18 inches (10 to 46 cm); light yellowish brown (10YR 6/4) sand, dark yellowish brown (10YR 4/6), moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; few medium, coarse, very fine, and fine roots throughout; few

very fine and fine dendritic tubular pores; common fine carbonate masses; 1 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

2R—18 inches (46 cm); fractured, unweathered sandstone bedrock.

Range in Characteristics

C horizon
- Hue: 10YR, 2.5Y
- Value: 5 to 6 dry, 4 to 6 moist
- Chroma: 3 to 6, dry or moist
- Texture: coarse sand, sand, loamy sand,
- Clay: 2 to 6 percent
- Reaction: moderately alkaline to strongly alkaline

Ck horizon
- Hue: 10YR, 2.5Y
- Value: 5 to 6 dry, 4 to 6 moist
- Chroma: 3 to 6, dry or moist
- Texture: coarse sand, sand, loamy sand
- Clay: 2 to 6 percent
- Reaction: moderately alkaline to strongly alkaline
- Calcium carbonate equivalent: 1 to 4 percent

Hawaikuh soils
Taxonomic classification: Fine, mixed, superactive, mesic Ustic Haplargids
Geomorphic position: occurs on fan remnants
Parent material: residuum weathered from sandstone and/or eolian sands derived from sandstone and shale
Slope: 1 to 6 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 35 percent
  - woody debris: 2 percent
  - bare soil: 63 percent
- surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 8.1 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: C
Present vegetation: pinyon, Utah juniper
Land capability (non irrigated): 7c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 38’ 25.90’’ north, 110° 13’ 4.30’’ west

A—0 to 4 inches (0 to 10 cm); brown (7.5YR 5/4) loamy sand, brown (7.5YR 4/3), moist; 5 percent clay; single grain; loose, loose, nonsticky, nonplastic; few medium, very fine, and few fine roots throughout; noneffervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk—4 to 19 inches (10 to 48 cm); strong brown (7.5YR 4/6) sandy clay loam, dark brown (7.5YR 3/4), moist; 30 percent clay; weak very coarse angular blocky structure; slightly hard, very friable, slightly sticky, very plastic; common very fine roots and few fine roots throughout; common very fine and fine dendritic tubular pores; common fine carbonate masses; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

2Btk—19 to 29 inches (48 to 74 cm); yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4), moist; 40 percent clay; moderate coarse prismatic parts to weak medium angular blocky structure; very hard, friable, slightly sticky, very plastic; few very fine and fine roots throughout; few very fine and fine dendritic tubular pores; very few distinct dark yellowish brown (10YR 4/6), moist, clay films on all faces of peds; common fine and medium carbonate nodules; violently effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual wavy boundary.

2Bk1—29 to 37 inches (74 to 94 cm); yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4), moist; 20 percent clay; massive; hard, firm, nonsticky, slightly plastic; few very fine roots throughout; few very fine dendritic tubular pores; common fine and medium carbonate masses; violently effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear wavy boundary.

2Bk2—37 to 45 inches (94 to 114 cm); dark yellowish brown (10YR 4/4) clay, dark yellowish brown (10YR 3/4), moist; 40 percent clay; moderate medium prismatic structure; hard, friable, slightly sticky, very plastic; few very fine and fine roots between peds; few very fine dendritic tubular pores; common fine, medium, and coarse carbonate nodules; violently effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt wavy boundary.

3Ck—45 to 60 inches (114 to 152 cm); strong brown (7.5YR 5/6) loamy fine sand, strong brown (7.5YR 4/6), moist; 8 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots throughout; few very fine dendritic tubular pores; common fine and medium carbonate masses; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

Range in Characteristics

Clay content of the control section (weighted average): 35 to 45 percent

A horizon
- Hue: 7.5YR, 10YR
- Value: 4 to 6, dry or moist
- Chroma: 4 to 6 dry, 3 to 6 moist
- Texture: loamy sand, loamy fine sand, sandy loam
- Clay: 5 to 15 percent
- Reaction: moderately alkaline to strongly alkaline

Bk horizon
Hue: 5YR, 7.5 YR, 10YR
Value: 4 to 6 dry, 3 to 6 moist
Chroma: 4 to 6, dry or moist
Texture: clay loam, sandy clay loam, sandy clay, silty clay
Clay: 25 to 40 percent
Reaction: moderately alkaline to strongly alkaline
Calcium carbonate equivalent: 0 to 4 percent

2Btk horizon
Hue: 7.5YR, 10YR
Value: 5 to 6 dry, 4 to 6 moist
Chroma: 3 to 4, dry or moist
Texture: clay loam, sandy clay, clay
Clay: 35 to 40 percent
Reaction: moderately alkaline to strongly alkaline
Calcium carbonate equivalent: 0 to 4 percent

2Bk horizons
Hue: 7.5YR, 10YR
Value: 4 to 6 dry, 3 to 6 moist
Chroma: 4 to 6, dry or moist
Texture: clay loam, sandy clay loam, sandy clay, clay
Clay: 20 to 40 percent
Reaction: moderately alkaline to strongly alkaline
Calcium carbonate equivalent: 0 to 4 percent

3Ck horizon
Hue: 7.5YR, 10YR, 2.5Y
Value: 5 to 6 dry, 4 to 6 moist
Chroma: 4 to 6, dry or moist
Texture: loamy sand, loamy fine sand
Clay: 8 to 10 percent
Reaction: moderately alkaline to strongly alkaline
Calcium carbonate equivalent: 0 to 4 percent

Argillic horizon – zone from 19 to 29 inches (2Btk horizon).

15—Cumulic Endoaquolls, 0 to 5 percent slopes

Map Unit Setting

Landform(s): terraces
Elevation: 7,100 to 7,200 feet (2,164 to 2,195 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (7.8 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (8.9 to 11.1 degrees C)
Frost-free period: 120 to 150 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-6AZ Colorado Plateau Pinyon-Juniper Sagebrush

Map Unit Composition

Cumulic Endoaquolls and similar soils: 85 percent
Minor Components: 15 percent
- Atrac and similar soils

- Gullied land
- Ustic Torriorthents

Soil Properties and Qualities

Cumulic Endoaquolls soils
Taxonomic classification: Cumulic Endoaquolls
Geomorphic position: poorly drained soils on gently sloping stream terraces
Parent material: alluvium derived from sandstone and shale
Slope: 0 to 5 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 70 percent
woody debris: 0 percent
bare soil: 30 percent
surface rock fragments

Drainage class: somewhat poorly drained
Ksat solum: 0.00 to 0.57 inches per hour (0.01 to 4.00 micrometers per second)

Available water capacity total inches: 9.1 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: very rare
Seasonal water table minimum depth: about 12 to 60 inches
Runoff class: very high
Hydrologic group: D
Land capability (irrigated): 2c

Typical Profile

Location
Geographic Coordinate System: 36° 11’ 55.40” north, 109° 7’ 32.90” west

Ap—0 to 7 inches (0 to 18 cm); dark reddish brown (5YR 3/2) clay loam, very dark gray (5YR 3/1), moist; 38 percent clay; massive; extremely hard, firm, very sticky, very plastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; strongly effervescent; slightly alkaline, pH 7.8; clear wavy boundary.

C—7 to 12 inches (18 to 30 cm); dark reddish brown (5YR 3/3) sandy clay, dark reddish brown (5YR 3/2), moist; 40 percent clay; massive; extremely hard, slightly rigid, very sticky, very plastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; violently effervescent; slightly alkaline, pH 7.8; clear wavy boundary.

Cg1—12 to 44 inches (30 to 112 cm); 2 percent reddish brown (5YR 5/4) and 98 percent dark reddish brown (5YR 3/2) sandy clay loam, 98 percent very dark gray (5YR 3/1), moist; 32 percent clay; massive; extremely hard, slightly rigid, moderately sticky, moderately plastic; common very fine roots throughout; common very fine dendritic tubular pores; 2 percent fine distinct reddish brown (5YR 5/4), dry, masses of oxidized iron with sharp boundaries in matrix; violently effervescent; slightly alkaline, pH 7.8; clear wavy boundary.

Cg2—44 to 60 inches (112 to 152 cm); brown (7.5YR 4/2) loamy sand, very dark gray (7.5YR 3/1), moist; 10 percent clay; massive; extremely hard, slightly rigid, slightly sticky, nonplastic; common very fine roots throughout; common very fine dendritic tubular pores; violently effervescent; slightly alkaline, pH 7.8; clear wavy boundary.

Range in Characteristics

Cumulic Endoaquolls have soil properties that vary greater than family class limits.

Ap horizon
- Hue: 5YR, 10YR
- Value: 3 dry or moist
- Chroma: 2 to 3, dry or moist
- Texture: clay loam, sandy loam
- Clay: 19 to 38 percent
- Reaction: slightly alkaline to moderately alkaline

C horizon
- Hue: 5YR, 10YR
- Value: 3 dry or moist
- Chroma: 2 to 3, dry or moist
- Texture: clay loam, sandy loam
- Clay: 35 to 45 percent
- Reaction: slightly alkaline to moderately alkaline

Cg horizons
- Hue: 5YR, 7.5YR
- Value: 3 to5 dry, 3 moist
- Chroma: 1 to 2, dry or moist
- Texture: sandy clay loam, fine sandy loam, loamy sand
- Clay: 10 to 32 percent
- Reaction: slightly alkaline to moderately alkaline

Mollic epipedon – the zone from 0 to 60 inches (Ap, C, and Cg horizons).

Endosaturation and redoximorphic features below 12 inches depth.

16—Cumulic Endoaquolls-Typic Argiustolls complex, 1 to 4 percent slopes

Map Unit Setting

Landform(s): mountain valleys
Elevation: 7,600 to 7,700 feet (2,316 to 2,347 meters)
Mean annual precipitation: 18 to 22 inches (457 to 559 millimeters)
Mean annual air temperature: 45 to 48 degrees F (7.2 to 8.9 degrees C)
Mean annual soil temperature: 47 to 50 degrees F (8.3 to 10.0 degrees C)
Frost-free period: 110 to 130 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-8AZ Colorado Plateau Ponderosa Pine Forests

Map Unit Composition

Cumulic Endoaquolls and similar soils: 40 percent
Typic Argiustolls and similar soils: 40 percent
Minor Components: 20 percent
- Coarse-loamy Typic Haplustolls

- Riverwash
- Water

Soil Properties and Qualities

Cumulic Endoaquolls soils
Taxonomic classification: Cumulic Endoaquolls
Geomorphic position: Occurs on mountain valley alluvial fan terraces and drainages
Parent material: valley side alluvium derived from sandstone over residuum weathered from sandstone
Slope: 1 to 3 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 100 percent
woody debris: 0 percent
bare soil: 0 percent
surface rock fragments

Drainage class: somewhat poorly drained
Ksat solum: 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)

Available water capacity total inches: 3.6 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Seasonal water table minimum depth: 12 to 60 inches
Runoff class: very low
Hydrologic group: A
Present vegetation: antelope bitterbrush, bluegrass, clover, ponderosa pine, Rocky Mountain juniper, western wheatgrass
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 13’ 2.30’’ north, 109° 2’ 23.50’’ west

A—0 to 5 inches (0 to 13 cm); dark gray (10YR 4/1) loamy sand, very dark gray (10YR 3/1), moist; 6 percent clay; soft, very friable, slightly sticky, nonplastic; many very fine and fine roots throughout; many very fine and fine dendritic tubular pores; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

AC1—5 to 17 inches (13 to 43 cm); dark gray (10YR 4/1) loamy sand, very dark gray (10YR 3/1), moist; 6 percent clay; soft, very friable, slightly sticky, nonplastic; many very fine roots and fine roots throughout; many very fine dendritic tubular pores; noneffervescent; neutral, pH 6.6; clear smooth boundary.

AC2—17 to 35 inches (43 to 89 cm); dark grayish brown (10YR 4/2) loamy sand, very dark grayish brown (10YR 3/2), moist; 8 percent clay; slightly hard, friable, slightly sticky, nonplastic; common fine roots throughout; common medium dendritic and many fine irregular pores; noneffervescent; neutral, pH 6.6; gradual smooth boundary.

AC3—35 to 60 inches (89 to 152 cm); dark grayish brown (10YR 4/2) loamy sand, very dark grayish brown (10YR 3/2), moist; 6 percent clay; slightly hard, friable, slightly sticky, nonplastic; common fine roots throughout; common medium dendritic and many fine interstitial pores; noneffervescent; neutral, pH 6.6.

Range in Characteristics

Cumulic Endoaquolls have soil properties that vary greater than family class limits.

A horizon
- Hue: 10YR
- Value: 3 to 4 dry, 2 to 3 moist
- Chroma: 1 to 2, dry or moist
- Texture: loamy sand, sandy loam, loam
- Clay: 6 to 21 percent

AC horizons
- Hue: 10YR
- Value: 3 to 4, dry or moist
- Chroma: 1 to 2, dry or moist
- Clay: 6 to 10 percent
- Texture: loamy sand

Aquic soil conditions – the zone from 12 to 60 inches.

Mollic epipedon – the zone from 0 to 60 inches (A and AC horizons).

Typic Argiustolls soils
Taxonomic classification: Typic Argiustolls
Geomorphic position: Occurs on mountain valley alluvial fan terraces and drainages.
Parent material: valley side alluvium derived from sandstone over residuum weathered from sandstone
Slope: 1 to 4 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 84 percent
  - woody debris: 1 percent
  - bare soil: 15 percent
- surface rock fragments

Drainage class: well drained
Ksat solum: 0.57 to 19.98 inches per hour (4.00 to 141.00 micrometers per second)

Available water capacity total inches: 8.9 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: B
Present vegetation: antelope bitterbrush, bluegrass, clover, Gambel oak, ponderosa pine, Rocky Mountain juniper, western wheatgrass
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 13’ 14.10’’ north, 109° 2’ 38.30’’ west

A—0 to 7 inches (0 to 18 cm); dark gray (10YR 4/1) loamy sand, very dark gray (10YR 3/1), moist; 7 percent clay; moderate medium granular and weak fine subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; many very fine and common fine roots throughout; common medium dendritic and many very fine and fine tubular pores; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

AB—7 to 24 inches (18 to 61 cm); very dark grayish brown (10YR 3/2) loam, black (10YR 2/1), moist; 25 percent clay; moderate medium and moderate coarse subangular blocky structure; moderately hard, firm, slightly sticky, slightly plastic; common very fine and fine roots throughout; common medium dendritic and many very fine and fine tubular pores; noneffervescent; neutral, pH 6.8; gradual smooth boundary.

Bt—24 to 32 inches (61 to 81 cm); reddish brown (5YR 4/3) loam, dark reddish brown (5YR 3/3), moist; 26 percent clay; moderate fine and medium subangular blocky structure; moderately hard, firm, slightly sticky, slightly plastic; common very fine and fine roots throughout; common medium dendritic and many fine tubular pores; distinct clay films on all faces of peds; noneffervescent; neutral, pH 7.2; clear smooth boundary.

2Btk—32 to 60 inches (81 to 152 cm); red (2.5YR 4/6) sandy clay loam, dark red (2.5YR 3/6), moist; 34 percent clay; strong medium subangular blocky structure; hard, extremely firm, moderately sticky, moderately plastic; common fine roots throughout; common very fine and fine dendritic tubular pores; distinct clay films on all faces of peds; common medium carbonate masses; strongly effervescent, 6 percent calcium carbonate equivalent; slightly alkaline, pH 7.6.

Range in Characteristics

Typic Argiustolls have soil properties that vary greater than family class limits.

A horizon
- Hue: 5YR, 10YR, 7.5YR
- Value: 3 to 5 dry, 2 to 3 moist
- Chroma: 1 to 3, dry or moist
- Texture: fine sandy loam, loamy sand
- Clay: 5 to 12 percent

AB horizons
- Hue: 5YR, 7.5YR, 10YR
- Value: 3 to 5 dry, 2 to 4 moist
- Chroma: 1 to 6, dry or moist
- Texture: fine sandy loam, sandy loam, loam
- Clay: 20 to 28 percent

Bt and Btk horizons
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 3 to 6 dry or moist
- Texture: loam, sandy clay loam, clay loam
- Clay: 29 to 35 percent clay
- Calcium carbonate equivalent: 1 to 6 percent

Argillic horizon – the zone from 24 to 60 inches (Bt horizon).

Mollic epipedon – the zone from 0 to 18 inches (A, AB horizons).

17—Denazar-Sheppard-Lithic Torriorthents complex, 1 to 20 percent slopes

Map Unit Setting

Landform(s): dune fields, structural benches
Elevation: 5,400 to 5,900 feet (1,646 to 1,798 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to 13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to 15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub – Grasslands

Map Unit Composition

Denazar and similar soils: 45 percent
Sheppard and similar soils: 30 percent
Lithic Torriorthents and similar soils: 15 percent
Minor Components: 10 percent
- Rock outcrop
- Councelor and similar soils
- Gullied land

Map unit originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Soil Properties and Qualities

Denazar soils
Taxonomic classification: Sandy, mixed, mesic Typic Haplocalcids
Geomorphic position: occurs on sand sheets on structural benches
Parent material: eolian sands derived from sandstone over residuum weathered from sandstone
Slope: 2 to 20 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 55 percent
    woody debris: 5 percent
    bare soil: 39 percent
  surface rock fragments
    gravel: 1 percent

Drainage class: excessively drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity total inches: 4.4 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low

Hydrologic group: A
Present vegetation: broom snakeweed, Ephedra
Land capability (non irrigated): 7c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 36’ 20.40’’ north, 109° 57’ 1.00’’ west

A—0 to 1 inch (0 to 3 cm); strong brown (7.5YR 5/6) fine sand, strong brown (7.5YR 4/6), moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine and fine roots throughout; noneffervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

Bk1—1 to 16 inches (3 to 41 cm); strong brown (7.5YR 5/6) loamy sand, strong brown (7.5YR 4/6), moist; 4 percent clay; weak very coarse angular blocky structure; soft, very friable, slightly sticky, nonplastic; few medium, coarse, and very coarse roots, and common very fine and fine roots throughout; few very fine and fine dendritic tubular pores; few fine carbonate masses; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk2—16 to 21 inches (41 to 53 cm); reddish yellow (7.5YR 6/6) loamy sand, strong brown (7.5YR 4/6), moist; 6 percent clay; weak very coarse angular blocky structure; moderately hard, friable, slightly sticky, nonplastic; few medium, very fine, and fine roots throughout; few very fine dendritic tubular pores; few fine carbonate nodules; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear wavy boundary.

2Bkk—21 to 40 inches (53 to 102 cm); light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4), moist; 10 percent clay; weak medium angular blocky structure; hard, firm, slightly sticky, slightly plastic; many very fine roots between peds; few very fine dendritic tubular pores; many very coarse carbonate masses; 5 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear irregular boundary.

2Bkn—40 to 60 inches (102 to 152 cm); 30 percent pale yellow (5Y 7/4) and 70 percent reddish yellow (7.5YR 6/6) loamy sand, strong brown (7.5YR 5/6), moist; 5 percent clay; massive; soft, very friable, slightly sticky, nonplastic; few medium roots and common very fine and fine roots throughout; few very fine and fine dendritic tubular pores; common coarse carbonate concretions; 2 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.8.

Range in Characteristics

A horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 5, dry or moist
- Chroma: 4 to 6, dry or moist
- Texture: sand, fine sand, loamy fine sand
- Clay: 2 to 7 percent
- Reaction: slightly alkaline to strongly alkaline

Bk horizons
- Hue: 7.5YR, 10YR
- Value: 5 to 7 dry, 4 to 7 moist
- Chroma: 2 to 6, dry or moist

Texture: fine sand, loamy sand
Clay: 4 to 7 percent
Reaction: moderately alkaline to strongly alkaline
Calcium carbonate equivalent: 1 to 4 percent

2Bkk and 2Bkn horizons
Hue: 7.5YR, 10YR, 5Y
Value: 5 to 7 dry, 4 to 7 moist
Chroma: 2 to 6, dry or moist
Texture: fine sand, sandy loam, loamy sand
Clay: 2 to 10 percent
Calcium carbonate equivalent: 5 to 15 percent

Calcic horizon – the zone from 21 to 60 inches (2Bkk and 2Bkn horizons).

Some pedons do not have a paralithic contact.
Some pedons do not have a 2Bkk horizon.

Sheppard soils
Taxonomic classification: Mixed, mesic Typic Torripsamments
Geomorphic position: occurs on sand sheets and dunes on dune fields
Parent material: eolian sands derived from sandstone
Slope: 1 to 10 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 55 percent
woody debris: 5 percent
bare soil: 40 percent
surface rock fragments

Drainage class: excessively drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity total inches: 4.2 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: A
Present vegetation: blue grama, globemallow, longleaf Mormon tea, sand muhly, yucca
Land capability (non irrigated): 7c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 38’ 4.00’’ north, 109° 57’ 8.10’’ west

Ck1—0 to 1 inch (0 to 3 cm); reddish yellow (7.5YR 6/6) sand, strong brown (7.5YR 4/6), moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; few

medium, very fine, and fine roots throughout; few fine carbonate masses; violently effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Ck2—1 to 16 inches (3 to 41 cm); light brown (7.5YR 6/4) sand, brown (7.5YR 4/4), moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; few medium and coarse roots, and common very fine and fine roots throughout; few very fine dendritic tubular pores; few fine carbonate masses; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Ck3—16 to 32 inches (41 to 81 cm); reddish yellow (7.5YR 6/6) sand, strong brown (7.5YR 4/6), moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; few coarse, very fine, and fine roots throughout; few very fine and fine dendritic tubular pores; few fine carbonate masses; 1 percent gravel; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Ck4—32 to 56 inches (81 to 142 cm); reddish yellow (7.5YR 6/6) fine sand, strong brown (7.5YR 5/6), moist; 2 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine roots and fine roots throughout; few very fine dendritic tubular pores; few fine carbonate masses; 1 percent gravel; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Ck5—56 to 60 inches (142 to 152 cm); light brown (7.5YR 6/4) fine sand, strong brown (7.5YR 5/6), moist; 2 percent clay; massive; moderately hard, very friable, nonsticky, nonplastic; few fine carbonate masses; 1 percent gravel; violently effervescent; strongly alkaline, pH 8.6.

Range in Characteristics

Ck horizons
- Hue: 5YR, 7.5YR
- Value: 4 to 7, dry or moist
- Chroma: 4 to 8, dry or moist
- Texture: fine sand, loamy fine sand, sand, loamy sand
- Clay: 2 to 8 percent
- Reaction: moderately alkaline to strongly alkaline
- Calcium carbonate equivalent: 0 to 4 percent

Lithic Torriorthents soils

Taxonomic classification: Lithic Torriorthents

Geomorphic position: occurs on escarpments and erosion remnants on structural benches

Parent material: colluvium derived from calcareous sandstone

Slope: 6 to 15 percent

Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 9 percent
  - woody debris: 1 percent
  - bare soil: 0 percent

surface rock fragments
gravel: 60 percent
cobble: 20 percent
stone: 10 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: excessively drained
Ksat solum: 5.95 to 99.92 inches per hour (42.00 to 705.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 0.4 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: D
Present vegetation: blue grama, longleaf Mormon tea, sand muhly
Land capability (non irrigated): 7c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 35’ 25.70’’ north, 109° 56’ 30.60’’ east

C1—0 to 4 inches (0 to 10 cm); light yellowish brown (10YR 6/4) extremely gravelly coarse sand, yellowish brown (10YR 5/6), moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; few very fine and fine roots throughout; 60 percent gravel and 2 percent cobble; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C2—4 to 14 inches (10 to 36 cm); light yellowish brown (10YR 6/4) gravelly coarse sand, yellowish brown (10YR 5/6), moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; few medium, very fine and fine roots throughout; few very fine dendritic tubular pores; 25 percent gravel and 1 percent cobble; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

R—14 inches (36 cm); fractured, unweathered sandstone bedrock.

Range in Characteristics

Lithic Torriorthents have soil properties that vary greater than family class limits.

C horizons
Hue: 7.5YR, 10YR
Value: 5 to 6, dry or moist
Chroma: 4 to 6, dry or moist
Texture: fine sand, coarse sand
Clay: 2 to 3 percent
Rock fragments: 25 to 65 percent
Reaction: moderately alkaline to strongly alkaline

18—Dune land

Map Unit Setting

Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Dune land: 100 percent
Map unit originates from the Soil Survey of Canyon De Chelly National Monument, Arizona.

Soil Properties and Qualities

Dune land

Range in Characteristics

Dune land areas consist of sand in ridges and intervening troughs that shift with the wind.

19—Gotho-Aneth complex, 1 to 10 percent slopes

Map Unit Setting

Landform(s): alluvial flats, canyons, terraces
Elevation: 5,300 to 6,100 feet (1,615 to 1,859 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Gotho and similar soils: 65 percent
Aneth and similar soils: 30 percent
Minor Components: 5 percent
- Riverwash
- Gullied land
- Active dunes and sand sheets
- Sodic soils
- Soil similar to Aneth with finer textures in the control section
- Soils similar to Gotho with coarser and finer textures in the control section

Map unit originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Soil Properties and Qualities

Gotho soils
Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents
Geomorphic position: occurs on stream terraces of valley floors
Parent material: alluvium derived from sandstone and shale and/or eolian deposits derived from sandstone and shale
Slope: 1 to 3 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent

moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 10 percent
woody debris: 5 percent
bare soil: 85 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.06 to 5.95 inches per hour (0.42 to 42.00 micrometers per second)

Available water capacity total inches: 6.4 (moderate)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: very rare
Runoff class: negligible
Hydrologic group: C
Present vegetation: greasewood
Land capability (non irrigated): 7c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 38’ 19.90’’ north, 109° 58’ 58.40’’ west

A—0 to 1 inch (0 to 3 cm); light yellowish brown (2.5Y 6/3) loam, light olive brown (2.5Y 5/3), moist; 20 percent clay; single grain; loose, loose, slightly sticky, very plastic; few very fine roots throughout; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Ck—1 to 10 inches (3 to 25 cm); light yellowish brown (2.5Y 6/3) sand, olive brown (2.5Y 4/3), moist; 3 percent clay; moderate medium platy structure; slightly hard, very friable, nonsticky, nonplastic; few medium roots, common very fine and few fine roots throughout; common very fine and few fine dendritic tubular pores; few fine carbonate masses; violently effervescent; moderately alkaline, pH 8.2; very abrupt smooth boundary.

Ab—10 to 12 inches (25 to 30 cm); light yellowish brown (2.5Y 6/4) sandy loam, olive brown (2.5Y 4/3), moist; 15 percent clay; weak thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots throughout; common very fine dendritic tubular pores; common fine carbonate masses; violently effervescent; moderately alkaline, pH 8.0; very abrupt smooth boundary.

2Ck1—12 to 27 inches (30 to 69 cm); grayish brown (2.5Y 5/2) silty clay, olive brown (2.5Y 4/3), moist; 45 percent clay; moderate very coarse prismatic parts to weak very thick platy structure; hard, firm, slightly sticky, very plastic; few medium and few very coarse roots, many very fine and fine roots throughout; common very fine and few fine dendritic tubular pores; many fine carbonate masses; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

2Ck2—27 to 40 inches (69 to 102 cm); light olive brown (2.5Y 5/3) sandy loam, olive brown (2.5Y 4/4), moist; 15 percent clay; massive; soft, very friable, nonsticky, nonplastic; few medium and coarse roots, common very fine and fine roots throughout; few very fine and fine dendritic tubular pores; few fine carbonate masses; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

2Ab—40 to 44 inches (102 to 112 cm); grayish brown (2.5Y 5/2) clay, olive brown (2.5Y 4/3), moist; 55 percent clay; weak thick platy structure; slightly hard, very friable, slightly sticky, very plastic; few medium roots, many very fine roots, and few fine roots throughout; few medium, common very fine, and few fine dendritic tubular pores; many fine carbonate masses; violently effervescent; moderately alkaline, pH 8.4; very abrupt wavy boundary.

3Ck—44 to 52 inches (112 to 132 cm); light olive brown (2.5Y 5/3) sand, olive brown (2.5Y 4/3), moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine roots throughout; few very fine and fine dendritic tubular pores; common fine carbonate masses; violently effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

3C—52 to 60 inches (132 to 152 cm); light yellowish brown (2.5Y 6/3) coarse sand, light olive brown (2.5Y 5/4), moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots throughout; few medium and fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Ab and Ab horizons
- Hue: 10YR, 2.5Y
- Value: 4 to 6, dry or moist
- Chroma: 2 to 6 dry, 3 to 4 moist
- Texture: sandy loam, silty clay, clay
- Clay: 3 to 60 percent
- Reaction: moderately alkaline to strongly alkaline
- Calcium carbonate equivalent: 1 to 3 percent

C and Ck horizons
- Hue: 7.5YR, 10YR, 2.5Y
- Value: 4 to 6, dry or moist
- Chroma: 2 to 4, dry or moist
- Texture: loamy sand, loamy fine sand, loamy very fine sand, sandy loam, fine sandy loam, very fine sandy loam, loam, sandy clay loam, clay loam, sandy clay
- Clay: 18 to 35 percent
- Reaction: moderately alkaline to very strongly alkaline
- Calcium carbonate equivalent: 1 to 3 percent

Aneth soils

Taxonomic classification: Sandy, mixed, mesic Typic Torriorthents
Geomorphic position: occurs on stream terraces on canyon bottoms
Parent material: alluvium derived from sandstone and shale and/or eolian deposits derived from sandstone and shale
Slope: 2 to 10 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 5 percent
  - woody debris: 0 percent

bare soil: 95 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.06 to 5.95 inches per hour (0.42 to 42.00 micrometers per second)

Available water capacity total inches: 5.4 (moderate)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: very rare
Runoff class: negligible
Hydrologic group: C
Present vegetation: fourwing saltbush, greasewood
Land capability (non irrigated): 7c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 35’ 22.10’’ north, 109° 52’ 10.00’’ west

A—0 to 2 inches (0 to 5 cm); pale brown (10YR 6/3) clay, brown (10YR 4/3), moist; 40 percent clay; moderate thick platy and weak medium granular structure; soft, very friable, moderately sticky, very plastic; few medium roots, very fine, and fine roots throughout; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

C—2 to 4 inches (5 to 10 cm); light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2), moist; 30 percent clay; moderate thin platy structure; slightly hard, very friable, slightly sticky, very plastic; few very fine and fine roots throughout; few very fine dendritic tubular pores; violently effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Ck1—4 to 9 inches (10 to 23 cm); grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2), moist; 45 percent clay; moderate thick platy parts to weak medium subangular blocky structure; slightly hard, very friable, moderately sticky, very plastic; common very fine roots and few fine roots throughout; few very fine dendritic tubular pores; common medium carbonate masses; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Ck2—9 to 13 inches (23 to 33 cm); brown (7.5YR 5/3) stratified sand to fine sand to fine sandy loam, brown (7.5YR 4/3), moist; 15 percent clay; massive; slightly hard, very friable, slightly sticky, moderately plastic; few very fine and fine roots throughout; few coarse, very fine, and fine dendritic tubular pores; few fine carbonate masses; strongly effervescent; moderately alkaline, pH 8.2; very abrupt smooth boundary.

2Ab—13 to 14 inches (33 to 36 cm); grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2), moist; 30 percent clay; weak thick platy structure; slightly hard, very friable, slightly sticky, very plastic; few very fine roots throughout; few very fine dendritic tubular pores; common medium carbonate masses; violently effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

2C—14 to 23 inches (36 to 58 cm); light brown (7.5YR 6/3) stratified sand to fine sand to loamy sand, brown (7.5YR 4/3), moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots and fine roots throughout; few medium, very fine, and fine dendritic tubular pores; slightly effervescent; moderately alkaline, pH 8.0; very abrupt smooth boundary.

2A’b—23 to 24 inches (58 to 61 cm); light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2), moist; 25 percent clay; weak thick platy structure; hard, very friable,

moderately sticky; few very fine and fine roots throughout; few very fine and fine dendritic tubular pores; common medium carbonate masses; violently effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

2C'—24 to 34 inches (61 to 86 cm); pale brown (10YR 6/3) stratified sand to fine sand to loamy sand, brown (10YR 4/3), moist; 3 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine roots throughout; few very fine and fine dendritic tubular pores; slightly effervescent; moderately alkaline, pH 8.0; very abrupt smooth boundary.

3Ck—34 to 60 inches (86 to 152 cm); strong brown (7.5YR 5/6) fine sand, strong brown (7.5YR 4/6), moist; 4 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots throughout; few very fine dendritic tubular pores; few fine carbonate masses; noneffervescent; moderately alkaline, pH 8.0.

Range in Characteristics

A horizon
- Hue: 10YR, 2.5Y
- Value: 5 to 6 dry, 4 to 6 moist
- Chroma: 3 to 6, dry or moist
- Texture: clay, sandy clay
- Clay: 35 to 50 percent
- Reaction: moderately alkaline to strongly alkaline

C and Ck horizons
- Hue: 7.5YR, 10YR, 2.5Y
- Value: 4 to 6, dry or moist
- Chroma: 2 to 8, dry or moist
- Texture: sand, fine sand, loamy sand, loamy fine sand, loamy very fine sand, sandy loam, fine sandy loam, clay loam, sandy clay, silty clay, clay
- Clay: 2 to 55 percent
- Reaction: moderately alkaline to strongly alkaline
- Calcium carbonate equivalent: 0 to 4 percent

2Ab horizons
- Hue: 10YR, 2.5Y
- Value: 5 to 6 dry, 4 to 6 moist
- Chroma: 2 to 4 dry, 2 to 4 moist
- Texture: sandy loam, loam, clay loam, clay
- Clay: 15 to 50 percent
- Reaction: moderately alkaline to strongly alkaline
- Calcium carbonate equivalent: 0 to 4 percent

20—Jacks family-Jacks complex, 2 to 5 percent slopes

Map Unit Setting

Landform(s): valley floors
Elevation: 7,300 to 7,700 feet (2,225 to 2,347 meters)
Mean annual precipitation: 18 to 22 inches (457 to 559 millimeters)
Mean annual air temperature: 45 to 48 degrees F (7.2 to 8.9 degrees C)
Mean annual soil temperature: 47 to 50 degrees F (8.3 to 10.0 degrees C)
Frost-free period: 110 to 130 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-8AZ Colorado Plateau Ponderosa Pine Forests

Map Unit Composition

Jacks family and similar soils: 70 percent
Jacks and similar soils: 25 percent
Minor Components: 5 percent
- Lithic Haplustepts and similar soils

Soil Properties and Qualities

Jacks family soils
Taxonomic classification: Fine, mixed, superactive, mesic Typic Haplustalfs
Geomorphic position: well-drained upland soils
Parent material: alluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale
Slope: 2 to 5 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 40 percent
woody debris: 10 percent
bare soil: 30 percent
surface rock fragments
gravel: 10 percent
channer: 10 percent

Drainage class: well drained
Ksat solum: 0.06 to 0.57 inches per hour (0.42 to 4.00 micrometers per second)

Available water capacity total inches: 10.4 (very high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: high
Hydrologic group: C
Present vegetation: broom snakeweed, Colorado pinyon, Douglas rabbitbrush, little sagebrush, slimstalk spiderling
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 56’ 15.90’’ north, 109° 14’ 17.40’’ west

A—0 to 3 inches (0 to 8 cm); reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4), moist; 45 percent clay; weak medium subangular blocky structure; moderately hard, friable, very sticky, very plastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bt—3 to 15 inches (8 to 38 cm); dark reddish brown (5YR 3/4) clay, dark reddish brown (5YR 3/3), moist; 42 percent clay; weak medium subangular blocky structure; very hard, very firm, very sticky, very plastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; very few distinct reddish brown

(5YR 4/3), dry, clay films on surfaces along root channels; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Btk—15 to 42 inches (38 to 107 cm); reddish brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/3), moist; 38 percent clay; weak medium subangular blocky structure; very hard, very firm, very sticky, very plastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; very few faint reddish brown (5YR 4/3), dry, clay films in root channels and/or pores and few distinct reddish brown (5YR 4/3), dry, clay films on all faces of peds; few fine carbonate masses; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt wavy boundary.

2C1—42 to 50 inches (107 to 127 cm); gray (5YR 5/1) clay loam, dark reddish gray (5YR 4/2), moist; 28 percent clay; massive; very hard, very firm, moderately sticky, moderately plastic; few very fine roots and fine roots throughout; common very fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

2C2—50 to 60 inches (127 to 152 cm); gray (5YR 5/1) channery loam, dark reddish gray (5YR 4/2), moist; 26 percent clay; massive; extremely hard, very firm, moderately sticky, moderately plastic; few very fine roots throughout; common very fine dendritic tubular pores; 5 percent fine distinct reddish yellow (7.5YR 6/8), moist, and yellowish red (5YR 5/6), moist, iron-manganese concretions with clear boundaries in matrix; 20 percent channer; strongly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

Jacks family differs from Jacks series because it contains identifiable secondary calcium carbonate, redoximorphic features, and is very deep to a lithic contact.

A horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 3 to 4, dry or moist
- Texture: clay loam, clay, loam, sandy clay loam, fine sandy loam
- Clay: 17 to 45 percent
- Reaction: neutral to moderately alkaline

Bt horizon
- Hue: 2.5YR, 5YR
- Value: 3 to 4 dry, 3 to 5 moist
- Chroma: 2 to 6, dry or moist
- Texture: clay loam, clay, loam
- Clay: 22 to 50 percent
- Reaction: slightly alkaline to moderately alkaline

Btk horizon
- Hue: 2.5YR, 5YR
- Value: 3 to 5 dry, 3 to 5 moist
- Chroma: 2 to 6, dry or moist
- Texture: clay loam, clay, loam
- Clay: 22 to 50 percent
- Reaction: slightly alkaline to moderately alkaline
- Calcium carbonate equivalent: 5 to 15 percent

C horizons
- Hue: 2.5YR, 5YR
- Value: 3 to 5 dry, 3 to 5 moist
- Chroma: 1 to 6, dry or moist

Texture: clay loam, loam
Clay: 26 to 28 percent
Rock fragments: 0 to 20 percent

Argillic horizon – zone from 15 to 42 inches (Bt and Btk horizons).

Some pedons have a Bw horizon.

Jacks soils
Taxonomic classification: Fine, mixed, superactive, mesic Typic Haplustalfs
Geomorphic position: occur on summits, slopes, and footslopes
Parent material: alluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale
Slope: 2 to 3 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 60 percent
woody debris: 10 percent
bare soil: 30 percent
surface rock fragments
gravel: 5 percent

Depth to restrictive feature(s): 40 to 60 inches to densic material
Drainage class: well drained
Ksat solum: 0.03 to 1.98 inches per hour (0.22 to 14.00 micrometers per second)

Available water capacity total inches: 8.9 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: D
Present vegetation: slimstalk spiderling, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 10’ 27.70’’ north, 109° 13’ 43.70’’ west

A—0 to 5 inches (0 to 13 cm); dark reddish brown (5YR 3/2) sandy loam, very dark gray (5YR 3/1), moist; 15 percent clay; moderate medium subangular blocky structure; moderately hard, firm, moderately sticky, slightly plastic; many very fine and common fine roots throughout; common fine dendritic tubular pores; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

BC—5 to 31 inches (13 to 79 cm); dark reddish brown (5YR 3/2) clay loam, very dark gray (5YR 3/1), moist; 30 percent clay; weak fine subangular blocky structure; extremely hard, extremely firm, very sticky, moderately plastic; common very fine roots throughout; common very fine dendritic tubular pores; noneffervescent; slightly alkaline, pH 7.6; abrupt wavy boundary.

Bt—31 to 55 inches (79 to 140 cm); yellowish red (5YR 4/6) sandy clay, reddish brown (5YR 4/4), moist; 42 percent clay; weak fine subangular blocky structure; rigid, rigid, very sticky, very plastic; common very fine roots throughout; common very fine and fine irregular pores; very few distinct reddish brown (5YR 4/4), dry, clay films on all faces of peds; 10 percent channer; slightly effervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Cd—55 to 60 inches (140 to 152 cm); 20 percent light gray (5YR 7/1) and 80 percent pinkish gray (5YR 6/2) clay, 20 percent light gray (5YR 7/1) and 80 percent gray (5YR 6/1), moist; 48 percent clay; massive; rigid, rigid, very sticky, very plastic; common medium and fine irregular pores; 19 percent channer; strongly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

Clay content of the control section (weighted average): 35 to 48 percent
Rock fragments of the control section: 0 to 19 percent

A horizon
- Hue: 5YR, 7.5YR
- Value: 3 to 5, dry or moist
- Chroma: 1 to 3, dry or moist
- Texture: loam, sandy loam, fine sandy loam
- Clay: 15 to 18 percent
- Reaction: slightly alkaline

BC horizon
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 3 to 7 dry, 3 to 5 moist
- Chroma: 1 to 6, dry or moist
- Texture: clay loam, clay, loam
- Clay: 19 to 48 percent
- Reaction: slightly alkaline to moderately alkaline

Bt horizon
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 3 to 5 dry, 3 to 5 moist
- Chroma: 1 to 6, dry or moist
- Texture: loam, clay loam, clay, sandy clay
- Clay: 19 to 48 percent
- Reaction: slightly alkaline to moderately alkaline

Cd horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 7 dry, 4 to 7 moist
- Chroma: 1 to 6, dry or moist
- Texture: clay loam, clay
- Clay: 38 to 48 percent

Argillic horizon – zone from 31 to 55 inches (Bt horizon).

21—Jacks-Flutedrock-Manuelito complex, 0 to 15 percent slopes

Map Unit Setting

Landform(s): hills, plateaus
Elevation: 7,300 to 8,000 feet (2,225 to 2,438 meters)

Mean annual precipitation: 18 to 22 inches (457 to 559 millimeters)
Mean annual air temperature: 45 to 48 degrees F (7.2 to 8.9 degrees C)
Mean annual soil temperature: 47 to 50 degrees F (8.3 to 10.0 degrees C)
Frost-free period: 110 to 130 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-8AZ Colorado Plateau Ponderosa Pine Forests

Map Unit Composition

Jacks and similar soils: 40 percent
Flutedrock and similar soils: 35 percent
Manuelito and similar soils: 20 percent
Minor Components: 5 percent
- Gully land
- Rock outcrop
- Soils similar to Flutedrock with gravel and cobbles greater than 15 percent

Soil Properties and Qualities

Jacks soils
Taxonomic classification: Fine, mixed, superactive, mesic Typic Haplustalfs
Geomorphic position: occurs on residuum on plateaus.
Parent material: residuum weathered from sandstone
Slope: 0 to 3 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 30 percent
    woody debris: 60 percent
    bare soil: 10 percent
  surface rock fragments

Depth to restrictive feature(s): 20 to 60 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)
Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 8.5 (high)
Shrink-swell potential: about 7.5 LEP (high)
Flooding hazard: none
Runoff class: negligible
Hydrologic group: C
Present vegetation: oak, ponderosa pine
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 13’ 22.10’’ north, 109° 10’ 30.50’’ west

Oi—0 to 1 inch (0 to 2 cm) slightly decomposed plant material; 1 percent clay; pH 7.2; very abrupt smooth boundary.

Oe—1 to 2 inches (2 to 5 cm) moderately decomposed plant material; 1 percent clay; pH 6.6; clear smooth boundary.

A—2 to 5 inches (5 to 13 cm); grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2), moist; 12 percent clay; weak medium angular blocky parts to weak very thin platy structure; soft, very friable, slightly sticky, slightly plastic; common medium, very fine, and fine roots throughout; common fine, medium and very fine dendritic tublar pores and many fine irregular pores; noneffervescent; slightly alkaline, pH 7.4; clear wavy boundary.

Bt1—5 to 11 inches (13 to 28 cm); brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4), moist; 28 percent clay; moderate medium and moderate fine angular blocky structure; very hard, firm, slightly sticky, slightly plastic; common medium, coarse, very fine, and fine roots throughout; common medium, coarse, very fine, and fine dendritic tubular pores; few distinct brown (7.5YR 4/4), dry, clay films on all faces of peds; noneffervescent; slightly alkaline, pH 7.4; gradual smooth boundary.

Bt2—11 to 35 inches (28 to 89 cm); brown (7.5YR 5/4) sandy clay, brown (7.5YR 4/4), moist; 40 percent clay; moderate fine and moderate medium angular blocky structure; very hard, firm, moderately sticky, moderately plastic; common medium and fine roots throughout; common medium and fine dendritic tubular pores; few distinct brown (7.5YR 4/4), dry, clay films on all faces of peds; noneffervescent; neutral, pH 7.2; clear smooth boundary.

Btk—35 to 50 inches (89 to 127 cm); 5 percent reddish gray (2.5YR 6/1) and 95 percent weak red (2.5YR 5/2) clay, weak red (2.5YR 4/2), moist; 55 percent clay; moderate fine angular blocky structure; very hard, firm, moderately sticky, very plastic; common fine roots between peds; common fine irregular pores; few distinct weak red (2.5YR 4/2), dry, clay films on all faces of peds and few distinct weak red (2.5YR 4/2), dry, pressure faces on vertical faces of peds; few fine and few medium carbonate masses; strongly effervescent, 2 percent calcium carbonate equivalent; neutral, pH 7.2; abrupt smooth boundary.

Cd—50 to 55 inches (127 to 140 cm); reddish gray (2.5YR 6/1) sandy clay loam, weak red (2.5YR 5/2), moist; 25 percent clay; massive; moderately hard, firm, slightly sticky, moderately plastic; common fine roots in cracks; common fine irregular pores; 5 percent gravel; strongly effervescent; moderately alkaline, pH 8.3; abrupt smooth boundary.

R—55 inches (140 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

A horizon
- Hue: 7.5YR, 10YR
- Value: 3 to 5, dry or moist
- Chroma: 2 to 4, dry or moist
- Texture: sandy loam, loam, silt loam, clay
- Clay: 5 to 22 percent

Bt horizons
- Hue: 2.5YR, 7.5YR, 10YR
- Value: 4 to 5, dry or moist
- Chroma: 4 to 6 dry, 3 to 6 moist
- Texture: sandy clay loam, clay loam, sandy clay, clay

Clay: 28 to 58 percent
Reaction: neutral to slightly alkaline

Btk horizon
Hue: 2.5YR
Value: 6 dry, 5 moist
Chroma: 1 dry, 2 moist
Texture: sandy clay loam, sandy clay, clay
Clay: 35 to 55 percent

Cd horizon
Hue: 2.5YR, 7.5YR, 5YR
Value: 4 to 7, dry or moist
Chroma: 1 to 6, dry or moist
Texture: sandy clay loam, clay
Clay: 25 to 46 percent
Rock fragments: 0 to 5 percent

Argillic horizon – zone from 5 to 50 inches (Bt horizons).

Some pedons do not have a k subdesignation.
Some pedons do not have O horizons.

Flutedrock soils
Taxonomic classification: Loamy, mixed, superactive, nonacid, mesic Lithic Ustorthents
Geomorphic position: occurs on residuum on plateaus.
Parent material: residuum weathered from sandstone
Slope: 1 to 15 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 35 percent
woody debris: 55 percent
bare soil: 5 percent
surface rock fragments
cobble: 3 percent
stone: 2 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: moderately well drained
Ksat solum: 0.20 to 0.57 inches per hour (1.40 to 4.00 micrometers per second)
Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 0.6 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none

Runoff class: low
Hydrologic group: D
Present vegetation: oak, ponderosa pine, yucca
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 14’ 6.20’’ north, 109° 9’ 8.10’’ west

Oi—0 to 2 inches (0 to 5 cm) slightly decomposed plant material; 1 percent clay; soft, friable, nonsticky, nonplastic; pH 6.6; abrupt wavy boundary.

AC—2 to 8 inches (5 to 20 cm); brown (7.5YR 5/3) channery sandy loam, brown (7.5YR 4/3), moist; 12 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common medium and coarse roots, and many very fine and fine roots throughout; interstitial pores; 5 percent gravel, 5 percent cobble, and 10 percent channer; noneffervescent; slightly alkaline, pH 7.6; abrupt wavy boundary.

R—8 inches (20 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 5 to 35 percent

AC horizon
- Hue: 7.5YR, 10YR
- Value: 3 to 6, dry or moist
- Chroma: 2 to 4, dry or moist
- Texture: sandy loam, fine sandy loam, loam
- Clay: 5 to 14 percent
- Reaction: neutral to slightly alkaline

Some pedons do not have O horizons.

Manuelito soils
Taxonomic classification: Fine-loamy, mixed, superactive, mesic Typic Haplustalfs
Geomorphic position: occurs on residuum on plateaus.
Parent material: residuum weathered from sandstone
Slope: 1 to 4 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 30 percent
  - woody debris: 60 percent
  - bare soil: 5 percent
- surface rock fragments
  - cobble: 3 percent
  - stone: 2 percent

Depth to restrictive feature(s): 20 to 40 inches to bedrock, lithic
Drainage class: moderately well drained
Ksat solum: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)
Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 4.2 (low)
Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none
Runoff class: low
Hydrologic group: C
Present vegetation: ponderosa pine, yucca
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 14’ 43.70’’ north, 109° 8’ 19.70’’ west

Oi—0 to 1 inch (0 to 3 cm) slightly decomposed plant material; 1 percent clay; pH 6.6; abrupt smooth boundary.

A—1 to 4 inches (3 to 10 cm); brown (10YR 5/3) loam, dark brown (10YR 3/3), moist; 20 percent clay; weak medium subangular blocky and weak fine granular structure; soft, very friable, slightly sticky, nonplastic; common medium roots and many very fine and fine roots throughout; many very fine and fine dendritic tubular pores; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

AB—4 to 6 inches (10 to 15 cm); brown (10YR 4/3) sandy clay loam, very dark grayish brown (10YR 3/2), moist; 22 percent clay; weak medium subangular blocky and weak fine angular blocky structure; hard, friable, moderately sticky, nonplastic; common medium roots and many very fine and fine roots throughout; many very fine and fine dendritic tubular pores; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

Bt1—6 to 19 inches (15 to 48 cm); reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4), moist; 32 percent clay; moderate medium angular blocky parts to moderate fine angular blocky structure; very hard, friable, very sticky, very plastic; common medium, very coarse, very fine, and fine roots throughout; common medium, very fine, and fine dendritic tubular pores; few distinct reddish brown (5YR 4/4), moist, clay films on all faces of peds; 2 percent gravel and 1 percent cobble; noneffervescent; slightly alkaline, pH 7.8; clear smooth boundary.

Bt2—19 to 25 inches (48 to 64 cm); reddish brown (5YR 5/4) gravelly sandy loam, reddish brown (5YR 4/4), moist; 18 percent clay; moderate medium angular blocky parts to weak fine angular blocky structure; hard, firm, slightly sticky, nonplastic; common medium and very fine roots throughout; many fine irregular pores; few faint reddish brown (5YR 4/4), moist, clay films on all faces of peds; 15 percent gravel; noneffervescent; slightly alkaline, pH 7.8; gradual smooth boundary.

C—25 to 33 inches (64 to 84 cm); reddish brown (5YR 5/3) gravelly sandy loam, reddish brown (5YR 5/4), moist; 8 percent clay; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine roots throughout; many fine irregular pores; 20 percent gravel; noneffervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

R—33 inches (84 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 3 to 15 percent

A and AB horizons
- Hue: 10YR
- Value: 3 to 5, dry or moist
- Chroma: 2 to 4 dry
- Texture: sandy loam, loam, sandy clay loam
- Clay: 8 to 22 percent

Bt horizons
Hue: 5YR, 7.5YR
Value: 4 to 5, dry or moist
Chroma: 4 to 6, dry or moist
Texture: sandy loam, sandy clay loam, sandy clay
Clay: 8 to 45 percent

C horizon
Hue: 5YR
Value: 5 dry or moist
Chroma: 3 dry, 4 moist
Texture: loamy sand, sandy loam
Clay: 4 to 8 percent

Argillic horizon – zone from 6 to 25 inches (Bt horizons).

Some pedons do not have O horizons.

22—Jocity-Nazlini complex, sodic, 0 to 4 percent slopes

Map Unit Setting

Landform(s): valley floors
Elevation: 5,300 to 5,500 feet (1,615 to 1,676 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to 13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-1AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Jocity and similar soils: 50 percent
Nazlini and similar soils: 40 percent
Minor Components: 10 percent similar soils
- Aneth and similar soils
- Tezinie and similar soils
- Urban lands

Soil Properties and Qualities

Jocity soils
Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents
Geomorphic position: occurs on stream terraces and floodplain steps
Parent material: alluvium derived from sandstone and shale and/or eolian deposits derived from sandstone
Slope: 0 to 4 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent

Physical cover
canopy plant cover: 25 percent
woody debris: 0 percent
bare soil: 75 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 10.1 (very high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: rare
Runoff class: medium
Hydrologic group: B
Present vegetation: prickly Russian thistle, rubber rabbitbrush, Russian olive, shadscale
Land capability (non irrigated): 2c

Typical Profile

Location
Geographic Coordinate System: 36° 15’ 20.60’’ north, 109° 36’ 13.20’’ west

Ap—0 to 2 inches (0 to 5 cm); reddish brown (2.5YR 5/4) sandy clay loam, reddish brown (2.5YR 4/4), moist; 22 percent clay; strong thick platy parts to medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots throughout; common very fine tubular pores; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Anp—2 to 12 inches (5 to 30 cm); reddish brown (2.5YR 5/4) clay loam, reddish brown (2.5YR 4/4), moist; 36 percent clay; strong medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots throughout; common very fine tubular pores; strongly effervescent; very strongly alkaline, pH 9.4; clear wavy boundary.

Ckn1—12 to 22 inches (30 to 56 cm); reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4), moist; 24 percent clay; moderate medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; common very fine roots throughout; common very fine tubular pores; strongly effervescent, 10 percent calcium carbonate equivalent; very strongly alkaline, pH 9.4; clear wavy boundary.

Ckn2—22 to 60 inches (56 to 152 cm); reddish brown (5YR 5/3) silt loam, reddish brown (5YR 4/4), moist; 25 percent clay; moderate medium subangular blocky and strong thin platy structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine roots throughout; common very fine tubular pores; violently effervescent, 12 percent calcium carbonate equivalent; very strongly alkaline, pH 9.4.

Range in Characteristics

Ap and Apn horizons
Hue: 5YR, 2.5YR
Value: 5 to 6 dry, 3 to 4 moist
Chroma: 3 to 4, dry or moist
Texture: fine sandy loam, sandy clay loam, silty clay loam, clay loam, clay
Clay: 12 to 42 percent
Reaction: moderately alkaline to very strongly alkaline
Sodium adsorption ratio: 20 to 75

Ckn horizons
Hue: 7.5YR, 10YR, 5YR, 2.5YR
Value: 4 to 6 dry, 2 to 5 moist
Chroma: 2 to 6, dry or moist
Texture: very fine sandy loam, silt loam, sandy clay loam, clay loam, clay
Clay: 18 to 55 percent
Reaction: moderately alkaline to very strongly alkaline
Calcium carbonate equivalent: 5 to 14 percent (carbonates are geogenic and non-diagnostic)
Sodium adsorption ratio: 20 to 75

Nazlini soils

Taxonomic classification: Coarse-silty, mixed, superactive, calcareous, mesic Typic Torrifluvents
Geomorphic position: occurs on stream terraces and floodplain steps
Parent material: alluvium derived from sandstone and shale and/or eolian deposits derived from sandstone
Slope: 0 to 3 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 20 percent
woody debris: 0 percent
bare soil: 80 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 9.9 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: rare
Runoff class: medium
Hydrologic group: B
Present vegetation: prickly Russian thistle, rubber rabbitbrush, shadscale
Land capability (non irrigated): 2c

Typical Profile

Location
Geographic Coordinate System: 36° 13’ 16.80’’ north, 109° 35’ 35.20’’ west

Anp1—0 to 4 inches (0 to 10 cm); reddish yellow (5YR 6/6) loam, yellowish red (5YR 5/6), moist; 16 percent clay; moderate thick platy structure; hard, friable, slightly sticky, nonplastic; common very fine roots throughout; common very fine and fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 9.0; abrupt smooth boundary.

Anp2—4 to 14 inches (10 to 35 cm); yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6), moist; 16 percent clay; moderate thick platy structure; hard, friable, slightly sticky, nonplastic; few very fine and fine roots throughout; few very fine and fine dendritic

tubular pores; violently effervescent; very strongly alkaline, pH 9.2; abrupt smooth boundary.

Cn1—14 to 51 inches (35 to 129 cm); yellowish red (5YR 5/6) silt loam, yellowish red (5YR 4/6), moist; 5 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; few very fine roots throughout; few very fine dendritic tubular pores; violently effervescent; very strongly alkaline, pH 9.7; abrupt smooth boundary.

Cn2—51 to 60 inches (129 to 152 cm); yellowish red (5YR 5/6) silt loam, yellowish red (5YR 4/6), moist; 17 percent clay; massive; soft, very friable, slightly sticky, nonplastic; few very fine roots throughout; few very fine dendritic tubular pores; violently effervescent; very strongly alkaline, pH 9.3.

Range in Characteristics

Anp horizons
- Hue: 7.5YR, 5YR, 2.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: very fine sandy loam, sandy clay loam, silt loam, silty clay loam, loam, clay loam, clay
- Clay: 12 to 48 percent
- Reaction: moderately alkaline, strongly alkaline to very strongly alkaline
- Calcium carbonate equivalent: 5 to 14 percent
- Sodium adsorption ratio: 15 to 101

Cn horizons
- Hue: 7.5YR, 5YR, 2.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 to 4, dry or moist
- Texture: loamy fine sand, stratified fine sandy loam, stratified clay loam, clay
- Clay: 5 to 55 percent
- Reaction: moderately alkaline, strongly alkaline to very strongly alkaline
- Calcium carbonate equivalent: 5 to 14 percent
- Sodium adsorption ratio: 15 to 101

23—Jocity-Tezinie complex, saline-sodic, 0 to 4 percent slopes

Map Unit Setting

Landform(s): valley floors
Elevation: 5,200 to 5,400 feet (1,585 to 1,646 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Jocity and similar soils: 70 percent
Tezinie and similar soils: 20 percent
Minor Components: 10 percent
- Nazlini and similar soils
- Urban land

Soil Properties and Qualities

Jocity soils
Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents
Geomorphic position: occurs on stream terraces and floodplain steps
Parent material: alluvium derived from sandstone and shale
Slope: 0 to 4 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 5 percent
woody debris: 0 percent
bare soil: 95 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 0.57 inches per hour (1.40 to 4.00 micrometers per second)

Available water capacity total inches: 10.4 (very high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: rare
Runoff class: medium
Hydrologic group: C
Land capability (irrigated): 2c

Typical Profile

Location
Geographic Coordinate System: 36° 24’ 38.80’’ north, 109° 36’ 3.20’’ west

Ap—0 to 8 inches (0 to 20 cm); reddish brown (2.5YR 5/4) clay loam, reddish brown (2.5YR 4/3), moist; 32 percent clay; single grain; loose, loose, moderately sticky, moderately plastic; interstitial pores; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Cn1—8 to 15 inches (20 to 38 cm); reddish brown (2.5YR 5/4) clay loam, reddish brown (2.5YR 4/4), moist; 31 percent clay; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common medium roots and many very fine roots throughout; common fine tubular pores; strongly effervescent; strongly alkaline, pH 8.6; gradual wavy boundary.

Cn2—15 to 26 inches (38 to 66 cm); red (2.5YR 5/6) clay, dark reddish brown (2.5YR 3/4), moist; 40 percent clay; strong coarse angular blocky structure; hard, firm, very sticky, very plastic; many very fine roots throughout; common very fine tubular pores; strongly effervescent; moderately alkaline, pH 8.3; clear wavy boundary.

C1—26 to 37 inches (66 to 94 cm); red (2.5YR 5/6) sandy clay loam, dark reddish brown (2.5YR 3/4), moist; 23 percent clay; massive; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots throughout; common very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.3; clear smooth boundary.

C2—37 to 42 inches (94 to 107 cm); red (2.5YR 5/6) clay loam, reddish brown (2.5YR 4/4), moist; 38 percent clay; massive; slightly hard, firm, very sticky, very plastic; common very fine tubular pores; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C3—42 to 60 inches (107 to 152 cm); light reddish brown (2.5YR 6/4) silt loam, reddish brown (2.5YR 4/3), moist; 21 percent clay; massive; soft, very friable, moderately sticky, moderately plastic; common very fine tubular pores; slightly effervescent; moderately alkaline, pH 8.1.

Range in Characteristics

Ap horizon
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 5 to 6 dry, 4 moist
- Chroma: 2 to 4, dry or moist
- Texture: clay, clay loam, loam, fine sandy loam
- Clay: 17 to 42 percent
- Reaction: moderately alkaline to very strongly alkaline

Cn horizons
- Hue: 2.5YR, 5YR, 7.5YR, 10YR
- Value: 4 to 6 dry, 3 or 4 moist
- Chroma: 2 to 6, dry or moist
- Texture: clay, clay loam, sandy clay loam, silty clay loam
- Clay: 18 to 42 percent
- Reaction: moderately alkaline to very strongly alkaline
- Sodium adsorption ratio: 20 to 35

C horizons
- Hue: 2.5YR, 5YR, 7.5YR, 10YR
- Value: 4 to 7 dry, 3 to 5 moist
- Chroma: 2 to 6, dry or moist
- Texture: sandy clay loam, silty clay loam, clay, clay loam, sandy clay, stratified clay and loam
- Clay: 14 to 40 percent
- Reaction: moderately alkaline to very strongly alkaline

Tezinie soils

Taxonomic classification: Fine, mixed, superactive, calcareous, mesic Typic Torrifluvents
Geomorphic position: occurs on stream terraces
Parent material: alluvium derived from sandstone and shale
Slope: 0 to 4 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 5 percent
  - woody debris: 0 percent
  - bare soil: 95 percent
- surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 9.3 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: rare
Runoff class: low
Hydrologic group: C
Land capability (irrigated): 2c

Typical Profile

Location
Geographic Coordinate System: 36° 24’ 0.40’’ north, 109° 37’ 0.00’’ west

Anp—0 to 8 inches (0 to 20 cm); reddish brown (2.5YR 5/4) clay loam, red (2.5YR 4/6), moist; 31 percent clay; weak very thick platy parts to strong medium subangular blocky structure; slightly hard, very friable, very sticky, very plastic; common very fine roots throughout; common very fine tubular pores; slightly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Cn1—8 to 22 inches (20 to 56 cm); reddish brown (2.5YR 5/4) clay, red (2.5YR 4/6), moist; 57 percent clay; strong medium angular blocky structure; hard, friable, very sticky, very plastic; common very fine roots throughout; common very fine tubular pores; faint pressure faces on all faces of peds; slightly effervescent; moderately alkaline, pH 8.1; gradual smooth boundary.

Cn2—22 to 60 inches (56 to 152 cm); reddish brown (2.5YR 5/4) silty clay, reddish brown (2.5YR 4/4), moist; 52 percent clay; strong coarse angular blocky structure; very hard, firm, very sticky, very plastic; common very fine tubular pores; faint pressure faces on all faces of peds; slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Clay content of the control section (weighted average): 36 to 54 percent

Anp horizons
- Hue: 2.5YR, 5YR, 7.5YR, 10YR, 10R
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 2 to 6, dry or moist
- Texture: clay, clay loam, loam, fine sandy loam
- Clay: 19 to 50 percent
- Reaction: moderately alkaline to very strongly alkaline
- Sodium adsorption ratio: 20 to 30
- EC: 4 to 10 mmhos/cm

Cn1 horizons
- Hue: 2.5YR, 5YR, 7.5YR, 10YR
- Value: 5 to 7 dry, 4 to 5 moist
- Chroma: 3 to 8, dry or moist
- Texture: clay, clay loam, sandy clay loam
- Clay: 23 to 58 percent
- Reaction: moderately alkaline to very strongly alkaline
- Sodium adsorption ratio: 20 to 30
- EC: 4 to 10 mmhos/cm

Cn2 horizons
- Hue: 2.5YR, 5YR, 7.5YR, 10YR
- Value: 5 to 7 dry, 4 to 5 moist
- Chroma: 3 to 8, dry or moist

Texture: silty clay, loamy fine sand, clay, clay loam, sandy clay loam
Clay: 5 to 58 percent
Reaction: strongly alkaline to very strongly alkaline
Sodium adsorption ratio: 13 to 20
EC: 2 to 4 mmhos/cm

24—Jocity-Tezinie-Nazlini complex, sodic, 0 to 5 percent slopes

Map Unit Setting

Landform(s): flood-plain steps, stream terraces
Elevation: 5,100 to 5,600 feet (1,550 to 1,707 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Jocity and similar soils: 30 percent
Tezinie and similar soils: 30 percent
Nazlini and similar soils: 25 percent
Minor Components: 15 percent
- Aneth and similar soils
- Gotho and similar soils
- Jeddito and similar soils
- Marcou and similar soils
- Sheppard and similar soils
- Riverwash
- Urban land

Soil Properties and Qualities

Jocity soils
Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents
Geomorphic position: occurs on flood-plain steps and terraces adjacent to stream channels
Parent material: alluvium derived from sandstone and shale
Slope: 0 to 5 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 20 percent
    woody debris: 0 percent

bare soil: 80 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.00 to 0.57 inches per hour (0.01 to 4.00 micrometers per second)

Available water capacity total inches: 10.7 (very high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: rare
Runoff class: medium
Hydrologic group: C
Present vegetation: greasewood, Russian thistle
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 23’ 46.70’’ north, 109° 36’ 21.20’’ west

Cn1—0 to 20 inches (0 to 51 cm); reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4), moist; 32 percent clay; weak thick platy structure; slightly hard, very friable, moderately sticky, moderately plastic; common very fine irregular pores; violently effervescent; strongly alkaline, pH 9.0; clear smooth boundary.

Cn2—20 to 44 inches (51 to 112 cm); light reddish brown (5YR 6/3) silty clay loam, reddish brown (5YR 5/4), moist; 30 percent clay; massive; slightly hard, friable, moderately sticky, moderately plastic; common very fine irregular pores; violently effervescent; strongly alkaline, pH 9.0; abrupt smooth boundary.

Cn3—44 to 60 inches (112 to 152 cm); reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4), moist; 44 percent clay; massive; hard, firm, very sticky, very plastic; common very fine irregular pores; violently effervescent; strongly alkaline, pH 8.8.

Range in Characteristics

Cn horizons
Hue: 7.5YR, 10YR, 5YR, 2.5YR
Value: 4 to 7 dry, 3 to 5 moist
Chroma: 3 to 6, dry or moist
Texture: loam, sandy clay loam, clay loam, silty clay loam, clay
Clay: 25 to 50 percent
Reaction: moderately alkaline to very strongly alkaline
Sodium adsorption ratio: 10 to 80

Some pedons do not have a Cn horizon.

Tezinie soils
Taxonomic classification: Fine, mixed, superactive, calcareous, mesic Typic Torrifluvents
Geomorphic position: occurs on flood-plain steps and terraces adjacent to stream channels
Parent material: alluvium derived from sandstone and shale
Slope: 0 to 2 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent

Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 25 percent
woody debris: 5 percent
bare soil: 70 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.00 to 1.98 inches per hour (0.01 to 14.00 micrometers per second)

Available water capacity total inches: 9.9 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: rare
Runoff class: high
Hydrologic group: D
Present vegetation: black greasewood, prickly Russian thistle
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 11’ 30.30” north, 109° 35’ 49.70” west

Cn1—0 to 1 inch (0 to 3 cm); reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4), moist; 24 percent clay; massive; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Cn2—1 to 16 inches (3 to 41 cm); reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4), moist; 36 percent clay; massive; soft, very friable, moderately sticky, slightly plastic; common medium, very fine, and fine roots throughout; common very fine and fine dendritic tubular pores; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Cn3—16 to 39 inches (41 to 99 cm); reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4), moist; 42 percent clay; massive; slightly hard, very friable, very sticky, very plastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.6; clear wavy boundary.

Cn4—39 to 46 inches (99 to 117 cm); light reddish brown (5YR 6/4) silty clay loam, reddish brown (5YR 5/3), moist; 30 percent clay; massive; soft, very friable, moderately sticky, moderately plastic; common very fine roots throughout; and common very fine dendritic tubular pores; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Cn5—46 to 60 inches (117 to 152 cm); light reddish brown (5YR 6/4) very fine sandy loam, reddish brown (5YR 5/3), moist; 18 percent clay; massive; slightly hard, friable, slightly sticky, nonplastic; common very fine roots throughout; common very fine dendritic tubular pores; violently effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

Cn horizons
Hue: 7.5YR, 10YR, 5YR, 2.5Y
Value: 3 to 6 dry, 3 to5 moist
Chroma: 2 to 6, dry or moist

Texture: very fine sandy loam, sandy loam, loam, sandy clay loam, silty clay loam, clay loam, clay
Clay: 12 to 50 percent
Reaction: moderately alkaline to very strongly alkaline
Sodium adsorption ratio: 5 to 20 percent

Some pedons have a Cn horizon that is strongly alkaline.

Nazlini soils

Taxonomic classification: Coarse-silty, mixed, superactive, calcareous, mesic Typic Torrifluvents
Geomorphic position: occurs on flood-plain steps and terraces adjacent to stream channels
Parent material: alluvium derived from sandstone and shale
Slope: 0 to 3 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 40 percent
woody debris: 0 percent
bare soil: 60 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 8.9 (high)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: rare
Runoff class: low
Hydrologic group: C
Present vegetation: alkali sacaton, galleta grass, greasewood, Indian ricegrass, rubber rabbitbrush, shadscale saltbush, squirrel tail
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 15’ 15.30’’ north, 109° 36’ 29.40’’ west

A1—0 to 8 inches (0 to 20 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 8 percent clay; moderate thin platy and moderate medium platy structure; soft, very friable, nonsticky, nonplastic; common medium and common fine roots throughout; common very fine and fine dendritic tubular pores; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

A2—8 to 19 inches (20 to 48 cm); reddish brown (5YR 5/4) silt loam, reddish brown (5YR 4/4), moist; 25 percent clay; moderate thin platy structure; soft, very friable, moderately sticky, moderately plastic; common medium roots, few very fine roots, and common fine roots throughout; common very fine tubular and common fine and very fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Cn1—19 to 32 inches (48 to 81 cm); light reddish brown (5YR 6/4) silt loam, reddish brown (5YR 5/4), moist; 15 percent clay; moderate thin platy structure; slightly hard, friable, moderately sticky, moderately plastic; few medium roots, common very fine and fine roots throughout; common very fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.8; clear smooth boundary.

Cn2—32 to 49 inches (81 to 124 cm); light reddish brown (5YR 6/3) loamy very fine sand, reddish brown (5YR 5/4), moist; 5 percent clay; massive; soft, very friable, slightly sticky, nonplastic; few medium, very fine, and fine roots throughout; common very fine and fine tubular pores; violently effervescent; strongly alkaline, pH 9.0; abrupt smooth boundary.

Cn3—49 to 60 inches (124 to 152 cm); reddish brown (5YR 5/4) very fine sandy loam, yellowish red (5YR 4/6), moist; 15 percent clay; massive; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots throughout; common very fine and fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.8.

Range in Characteristics

A horizons
- Hue: 7.5YR, 5YR, 2.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 2 to 6, dry or moist
- Texture: loamy very fine sand, fine sandy loam, very fine sandy loam, loam, silt loam, clay loam, silty clay loam
- Clay: 5 to 30 percent
- Reaction: moderately alkaline to very strongly alkaline

Cn horizons
- Hue: 7.5YR, 10YR, 5YR, 2.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 2 to 6, dry or moist
- Texture: loamy very fine sand, fine sandy loam, very fine sandy loam, loam, silt loam, clay loam, silty clay loam
- Clay: 5 to 30 percent
- Reaction: moderately alkaline to very strongly alkaline
- Sodium adsorption ratio: 10 to 100

25—Kachina-Evpark family-Gladel family complex, 2 to 35 percent slopes

Map Unit Setting

Landform(s): structural benches
Elevation: 6,700 to 7,510 feet (2,042 to 2,289 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (7.8 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (8.9 to 11.1 degrees C)
Frost-free period: 120 to150 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-6AZ Colorado Plateau Pinyon-Juniper Sagebrush

Map Unit Composition

Kachina and similar soils: 35 percent
Evpark family and similar soils: 25 percent
Gladel family and similar soils: 25 percent

Minor Components: 15 percent
- Plumasano and similar soils
- Royosa and similar soils
- Aridic Ustorthents and similar soils
- Rock outcrop
- Riverwash
- Soils similar to Kachina with yellower hues

Soil Properties and Qualities

Kachina soils
Taxonomic classification: Fine-loamy, mixed, superactive, mesic Aridic Haplustepts
Geomorphic position: occurs on structural benches
Parent material: eolian deposits derived from sandstone and/or alluvium derived from sandstone and/or residuum weathered from sandstone and shale
Slope: 2 to 12 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 70 percent
woody debris: 20 percent
bare soil: 10 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 0.57 inches per hour (1.40 to 4.00 micrometers per second)

Available water capacity total inches: 8.7 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: C
Present vegetation: blue grama, broom snakeweed, pinyon pine, Utah juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 14’ 38.90’’ north, 109° 14’ 34.70’’ west

A—0 to 2 inches (0 to 5 cm); brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2), moist; 24 percent clay; weak fine subangular blocky and weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine roots throughout; common very fine interstitial pores; 5 percent channer; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

Bw1—2 to 12 inches (5 to 30 cm); reddish brown (5YR 4/3) sandy clay loam, dark reddish brown (5YR 3/3), moist; 25 percent clay; moderate fine subangular blocky structure; slightly hard, friable, very sticky, very plastic; common very fine roots throughout; common very fine and fine tubular pores; 4 percent gravel and 4 percent channer; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

Bw2—12 to 30 inches (30 to 76 cm); reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4), moist; 28 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; hard, firm, very sticky, very plastic; common coarse and very fine roots throughout; common very fine tubular pores; 5 percent channer; slightly effervescent; neutral, pH 7.2; abrupt smooth boundary.

Bk—30 to 60 inches (76 to 152 cm); light reddish brown (5YR 6/4) loam, reddish brown (5YR 4/4), moist; 20 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; hard, friable, very sticky, very plastic; common coarse and common fine roots throughout; common very fine tubular pores; many coarse carbonate masses; violently effervescent, 5 percent calcium carbonate equivalent; slightly alkaline, pH 7.8.

Range in Characteristics

Clay content of the control section (weighted average): 17 to 35 percent
Rock fragments of the control section: 0 to 10 percent

A horizon
- Hue: 5YR, 7.5YR, Value: 4 to 6 dry, 3 to 4 moist
- Chroma: 3 to 4 dry, 2 to 4 moist
- Texture: fine sandy loam, very fine sandy loam, loam, clay loam
- Clay: 13 to 27 percent
- Reaction: neutral to moderately alkaline

Bw horizons
- Hue: 5YR, 7.5YR, 2.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: fine sandy loam, loam, sandy clay loam, clay loam
- Clay: 17 to 36 percent

Bk horizon
- Hue: 5YR
- Value: 4 to 6, dry or moist
- Chroma: 4 to 8, dry or moist
- Texture: fine sandy loam, sandy clay loam, loam, clay loam
- Clay: 17 to 36 percent

Cambic horizon – the zone from 2 to 30 inches (Bw horizons).

Bk horizon does not meet the requirements for a calcic diagnostic horizon.

Evpark family soils
Taxonomic classification: Fine-loamy, mixed, superactive, mesic Aridic Haplustalfs
Geomorphic position: occurs on structural benches
Parent material: eolian deposits derived from sandstone and/or alluvium derived from sandstone and/or residuum weathered from sandstone and shale
Slope: 2 to 5 percent
Surface cover
- Biological crust
  - cyanobacteria: 5 percent
  - lichen: 0 percent
  - moss: 5 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 80 percent

woody debris: 10 percent
bare soil: 10 percent
surface rock fragments

Depth to restrictive feature(s): 20 to 40 inches to bedrock, lithic
Drainage class: moderately well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 5.5 (moderate)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: C
Present vegetation: pinyon, ponderosa pine, Utah juniper, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 11’ 43.00’’ north, 109° 18’ 59.60’’ west

A—0 to 5 inches (0 to 13 cm); dusky red (2.5YR 3/2) and reddish brown (2.5YR 4/4) loam; 17 percent clay; moderate fine granular and moderate thin platy structure; soft, very friable, slightly sticky, slightly plastic; common medium, very fine, and fine roots throughout; common fine dendritic tubular pores; 15 percent channer; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bt—5 to 16 inches (13 to 41 cm); reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/3), moist; 35 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few medium roots and common very fine and fine roots throughout; common very fine and fine tubular pores; very few faint reddish brown (5YR 4/3), dry, pressure faces on vertical faces of peds and few distinct reddish brown (5YR 4/3), dry, clay films on all faces of peds; 10 percent channer; slightly effervescent; slightly alkaline, pH 7.6; clear smooth boundary.

C—16 to 34 inches (41 to 86 cm); light yellowish brown (10YR 6/4) channery sandy clay loam, very pale brown (10YR 7/4), moist; 30 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; few medium roots and common very fine and fine roots throughout; interstitial pores; 15 percent channer; strongly effervescent; slightly alkaline, pH 7.6; clear smooth boundary.

R—34 inches (86 cm); weathered, unfractured sandstone bedrock.

Range in Characteristics

Evpark family differs from the series because they do not have identifiable secondary calcium carbonate.

A horizon
Hue: 2.5YR, 5YR, 7.5YR, 10YR,
Value: 3 to 6 dry, 3 to 4 moist
Chroma: 2to 6 dry, 2 to 4 moist
Texture: loamy fine sand, fine sandy loam, sandy loam, loam
Clay: 6 to 26 percent
Reaction: slightly alkaline to moderately alkaline

Bt horizon
Hue: 5YR, 7.5YR

Value: 3 to 5 dry, 3 to 4 moist
Chroma: 3 to 6 dry, 2 to 6 moist
Texture: fine sandy loam, loam, sandy clay loam, sandy clay, clay loam
Clay: 18 to 38 percent

C horizon
Hue: 7.5YR, 5YR, 10YR
Value: 5 to 7, dry or moist
Chroma: 4 to 6, dry or moist
Texture: sandy clay loam, clay loam
Clay: 26 to 30 percent

Argillic horizon – zone from 5 to 16 inches (Bt horizon).

Gladel family soils
Taxonomic classification: Loamy, mixed, superactive, mesic Aridic Lithic Haplustepts
Geomorphic position: occurs on ridges on structural benches
Parent material: eolian deposits derived from sandstone and/or alluvium derived from sandstone and/or residuum weathered from sandstone and shale
Slope: 3 to 35 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 70 percent
woody debris: 10 percent
bare soil: 20 percent
surface rock fragments

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 1.5 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: medium
Hydrologic group: C
Present vegetation: blue grama, pinyon, Utah juniper, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 14’ 30.60’’ north, 109° 14’ 29.70’’ west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/3) fine sandy loam, dark brown (7.5YR 3/3), moist; 8 percent clay; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine roots throughout; common very fine interstitial pores; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

Bw—2 to 12 inches (5 to 30 cm); dark reddish brown (5YR 3/3) channery sandy clay loam, dark reddish brown (5YR 3/3), moist; 27 percent clay; moderate and moderate fine subangular blocky structure; hard, firm, very sticky, very plastic; common coarse and very fine roots throughout; common very fine tubular pores; 20 percent channer; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

R—12 inches (30 cm); weathered, unfractured sandstone bedrock.

Range in Characteristics

Gladel family differs from the series because they have clay content of 18 to 35 percent in the particle control section. Gladel series has clay content of 8 to 18 percent.

A horizon
- Hue: 5YR, 7.5YR, 10YR
- Value: 4 to 6 dry, 3 moist
- Chroma: 2 to 4, dry or moist
- Texture: loamy fine sand, fine sandy loam, very fine sandy loam, gravely fine sandy loam
- Clay: 7 to 15 percent
- Reaction: neutral to moderately alkaline

Bw horizon
- Hue: 5YR, 7.5YR
- Value: 3 to 6 dry, 3 to 4 moist
- Chroma: 3 to 6 moist, 3 to 4 moist
- Texture: fine sandy loam, sandy clay loam, channery sandy clay loam
- Clay: 16 to 42 percent
- Rock fragments: 0 to 20 percent

Cambic horizon – the zone from 2 to 10 inches (Bw horizon).

26—Lithic Haplustepts-Jacks family-Pachic Haplustolls complex, 4 to 40 percent slopes

Map Unit Setting

Landform(s): escarpments, hills
Elevation: 7,100 to 7,800 feet (2,164 to 2,377 meters)
Mean annual precipitation: 18 to 22 inches (457 to 559 millimeters)
Mean annual air temperature: 45 to 48 degrees F (7.2 to 8.9 degrees C)
Mean annual soil temperature: 47 to 50 degrees F (8.3 to 10.0 degrees C)
Frost-free period: 110 to 130 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-8AZ Colorado Plateau Ponderosa Pine Forests

Map Unit Composition

Lithic Haplustepts and similar soils: 35 percent
Jacks family and similar soils: 25 percent
Pachic Haplustolls and similar soils: 25 percent
Minor Components: 15 percent
- Manuelito and similar soils
- Soils similar to Pachic Haplustolls with moderately deep to bedrock
- Gullied land
- Rock outcrop

Soil Properties and Qualities

Lithic Haplustepts soils
Taxonomic classification: Lithic Haplustepts
Geomorphic position: occurs on sideslopes of hills and escarpments
Parent material: residuum weathered from sandstone
Slope: 5 to 40 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 25 percent
    woody debris: 50 percent
    bare soil: 10 percent
  surface rock fragments
    gravel: 10 percent
    cobble: 5 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, paralithic; 3 to 20 inches to bedrock, lithic
Drainage class: somewhat poorly drained
Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.00 to 0.57 inches per hour (0.00 to 4.00 micrometers per second)

Available water capacity total inches: 2.1 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: high
Hydrologic group: D
Present vegetation: ponderosa pine, Rocky Mountain juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 14’ 50.00’’ north, 109° 10’ 41.00’’ west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/4) sandy loam, brown (7.5YR 4/3), moist; 10 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine roots throughout; common very fine dendritic tubular pores; 5 percent gravel; noneffervescent; slightly alkaline, pH 7.8; clear smooth boundary.

Bw—2 to 15 inches (5 to 38 cm); reddish brown (5YR 4/3) sandy clay loam, dark reddish brown (5YR 3/3), moist; 33 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots throughout; common very fine dendritic tubular pores; few faint dark reddish brown (5YR 3/3), dry, pressure faces on all faces of peds; 10 percent gravel; noneffervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Cr—15 to 18 inches (38 to 46 cm); weathered, fractured sandstone bedrock; abrupt smooth boundary.

R—18 inches (46 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

Lithic Haplustepts have soil properties that vary greater than family class limits.

Clay content of the control section (weighted average): 20 to 40 percent
Rock fragments of the control section: 5 to 20 percent

A horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 2 to 4, dry or moist
- Texture: sandy loam, fine sandy loam, loam, sandy clay loam, clay loam, clay
- Clay: 10 to 50 percent

Bw horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 2 to 4, dry or moist
- Texture: loam, sandy clay loam, clay loam, clay
- Clay: 10 to 50 percent
- Reaction: slightly alkaline to moderately alkaline

Cambic horizon – the zone from 2 to 15 inches (Bw horizon).

Some pedons do not have a Cr horizon.

Jacks family soils
Taxonomic classification: Fine, mixed, superactive, mesic Typic Haplustalfs
Geomorphic position: occurs on sideslopes of hills and escarpments
Parent material: slope alluvium derived from sandstone over residuum weathered from sandstone
Slope: 5 to 20 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 30 percent
  - woody debris: 65 percent
  - bare soil: 0 percent
- surface rock fragments
  - cobble: 5 percent

Drainage class: well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 9.5 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: medium
Hydrologic group: C
Present vegetation: Gambel oak, pinyon, ponderosa pine, Rocky Mountain juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 14’ 53.60’’ north, 109° 10’ 29.00’’ west

Oi—0 to 1 inch (0 to 3 cm) slightly decomposed plant material; 15 percent clay; hard, extremely firm, moderately sticky, moderately plastic; noneffervescent; neutral, pH 7.2; abrupt wavy boundary.

A—1 to 4 inches (3 to 10 cm); reddish brown (5YR 4/4) loam, reddish brown (5YR 4/3), moist; 15 percent clay; weak medium subangular blocky structure; soft, friable, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; noneffervescent; slightly alkaline, pH 7.4; clear wavy boundary.

Btk—4 to 19 inches (10 to 48 cm); reddish brown (5YR 4/4) clay loam, reddish brown (5YR 4/3), moist; 38 percent clay; strong medium subangular blocky structure; hard, firm, very sticky, very plastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; few distinct reddish brown (5YR 4/3), dry, clay films on all faces of peds; common fine carbonate masses; slightly effervescent, 5 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; clear wavy boundary.

Btk2—19 to 32 inches (48 to 81 cm); reddish brown (5YR 4/4) clay, reddish brown (5YR 4/3), moist; 45 percent clay; strong medium angular blocky structure; hard, firm, very sticky, very plastic; common very fine roots throughout; common very fine dendritic tubular pores; few distinct reddish brown (5YR 4/3), dry, clay films on all faces of peds; common fine carbonate masses; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

2Ck—32 to 60 inches (81 to 152 cm); weak red (2.5YR 4/2) clay, weak red (2.5YR 4/2), moist; 50 percent clay; strong medium angular blocky structure; hard, firm, very sticky, very plastic; common very fine roots throughout; common very fine dendritic tubular pores; common fine carbonate masses; strongly effervescent, 5 percent calcium carbonate equivalent; slightly alkaline, pH 7.8.

Range in Characteristics

Jacks family differs from Jacks series because they contain identifiable secondary calcium carbonate and are very deep to a lithic contact.

A horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 3 to 4 dry, 1 to 4 moist
- Texture: very fine sandy loam, loam, clay
- Clay: 5 to 40 percent
- Reaction: neutral alkaline to slightly alkaline

Btk horizon
- Hue: 5YR, 7.5YR
- Value: 3 to 6, dry or moist
- Chroma: 2 to 4, dry or moist
- Texture: clay loam, sandy clay, clay
- Clay: 35 to 55 percent
- Reaction: slightly alkaline to moderately alkaline
- Calcium carbonate equivalent: 5 to 10 percent

2Ck horizon
- Hue: 2.5YR, 5YR
- Value: 3 to 5, dry or moist
- Chroma: 2 to 4, dry or moist

Texture: sandy clay loam, clay loam, sandy clay, clay
Clay: 25 to 50 percent
Reaction: slightly alkaline to moderately alkaline
Calcium carbonate equivalent: 5 to 10 percent

Argillic horizon – zone from 4 to 19 inches (Btk horizon).

Some pedons have a Bw horizon.
Some pedons do not have a Bk horizon.
Some pedons do not have a 2Ck horizon.
Some pedons do not have an O horizon.

Pachic Haplustolls soils
Taxonomic classification: Pachic Haplustolls
Geomorphic position: occurs on sideslopes of hills and escarpments
Parent material: residuum weathered from sandstone and/or slope alluvium derived from sandstone
Slope: 4 to 8 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 35 percent
woody debris: 60 percent
bare soil: 0 percent
surface rock fragments
flagstone: 5 percent

Drainage class: well drained
Ksat solum: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 10.9 (very high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: medium
Hydrologic group: C
Present vegetation: pinyon, ponderosa pine
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 14’ 57.30’’ north, 109° 10’ 13.10’’ west

Oi—0 to 1 inch (0 to 3 cm) slightly decomposed plant material; 22 percent clay; noneffervescent; neutral, pH 6.8; abrupt wavy boundary.

A—1 to 5 inches (3 to 13 cm); dark brown (7.5YR 3/3) loam, very dark gray (7.5YR 3/1), moist; 22 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; noneffervescent; neutral, pH 7.2; clear wavy boundary.

Bw1—5 to 23 inches (13 to 58 cm); dark reddish brown (5YR 3/3) clay loam, dark reddish brown (5YR 3/2), moist; 38 percent clay; strong medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common medium and very fine roots throughout; common very fine dendritic tubular pores; few distinct dark reddish brown (5YR 3/3), dry, pressure faces on all faces of peds; noneffervescent; neutral, pH 7.2; clear wavy boundary.

Bw2—23 to 32 inches (58 to 81 cm); dark reddish brown (5YR 3/2) clay, dark reddish brown (5YR 3/2), moist; 45 percent clay; strong medium angular blocky structure; very hard, firm, very sticky, very plastic; common very fine roots throughout; common very fine dendritic tubular pores; common distinct dark reddish brown (5YR 3/3), dry, pressure faces on all faces of peds; noneffervescent; slightly alkaline, pH 7.4; clear wavy boundary.

2BC—32 to 60 inches (81 to 152 cm); reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4), moist; 35 percent clay; moderate medium subangular blocky and moderate medium angular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine irregular pores; common distinct reddish brown (5YR 4/3), dry, pressure faces on all faces of peds; noneffervescent; slightly alkaline, pH 7.6.

Range in Characteristics

Pachic Haplustolls have soil properties that vary greater than family class limits.

A horizon
- Hue: 5YR, 7.5YR
- Value: 3 to 4 dry
- Chroma: 1 to 3, dry or moist
- Texture: very fine sandy loam, loam, sandy clay loam, clay loam
- Clay: 8 to 35 percent
- Reaction: neutral to slightly alkaline

Bw and 2BC horizons
- Hue: 5YR, 7.5YR
- Value: 3 to 4, dry or moist
- Chroma: 2 to 4, dry or moist
- Texture: loam, clay loam, sandy clay, clay
- Clay: 15 to 50 percent
- Reaction: neutral to moderately alkaline

Mollic epipedon – the zone from 1 to 32 inches (A and Bw horizons).

Cambic horizon – the zone from 5 to 32 inches (Bw horizons).

Some pedons do not have O horizons.

27—Lithic Ustic Torriorthents-Begay complex, rocky, 1 to 30 percent slopes

Map Unit Setting

Landform(s): ridges, structural benches
Elevation: 5,400 to 6,000 feet (1,646 to 1,829 meters)
Mean annual precipitation: 10 to14 inches (254 to356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 1 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 135 to 165 days

Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush-Grasslands

Map Unit Composition

Lithic Ustic Torriorthents and similar soils: 65 percent
Begay and similar soils: 25 percent
Minor Components: 10 percent
- Begay and similar soils that have finer textures and bedrock between 55 and 80 inches
- Moenkopie and similar soils
- Tewa and similar soils
- Rizno and similar soils
- Gullied land
- Riverwash
- Rock outcrop
- Lithic Ustic Torriorthents with stones or boulders at the surface

Soil Properties and Qualities

Lithic Ustic Torriorthents soils
Taxonomic classification: Lithic Ustic Haplocambids
Geomorphic position: occurs in shallow deposits on structural benches
Parent material: residuum weathered from sandstone and/or slope alluvium derived from sandstone and/or eolian sands
Slope: 1 to 7 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 5 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 40 percent
    woody debris: 13 percent
    bare soil: 30 percent
  surface rock fragments
    gravel: 10 percent
    cobble: 2 percent
    boulder: 5 percent
    channer: 10 percent
    flagstone: 10 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: somewhat poorly drained
Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 2.5 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: medium
Hydrologic group: D

Present vegetation: Bigelow sagebrush, blue grama, broom snakeweed, Cutler Mormon tea, Douglas rabbitbrush, galleta, prickly pear, shadscale saltbush, Utah juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 18’ 16.70’’ north, 109° 30’ 38.40’’ west

A—0 to 2 inches (0 to 5 cm); yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6), moist; 13 percent clay; weak thin platy structure; soft, very friable, slightly sticky, nonplastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; 10 percent channer; violently effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bw—2 to 12 inches (5 to 30 cm); yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6), moist; 30 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.6; abrupt wavy boundary.

2C—12 to 18 inches (30 to 46 cm); pale yellow (2.5Y 7/4) channery loam, light yellowish brown (2.5Y 6/4), moist; 22 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common very fine roots throughout; common very fine tubular pores; 20 percent channer; violently effervescent; strongly alkaline, pH 8.6; abrupt wavy boundary.

2R—18 to 28 inches (46 to 71 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

Lithic Ustic Torriorthents have properties that vary greater than family class limits.

Rock fragments in the control section: 0 to 30 percent

A horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 4 to 6 moist
- Chroma: 4 to 6, dry or moist
- Texture: sandy loam, loamy sand, loamy fine sand
- Clay: 7 to 15 percent
- Reaction: moderately alkaline to strongly alkaline

Bw horizon
- Hue: 5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: sandy clay loam, fine sandy loam, sandy loam
- Clay: 12 to 32 percent
- Reaction: moderately alkaline to strongly alkaline

C horizon
- Hue: 2.5Y
- Value: 5 to 7, dry or moist
- Chroma: 4 to 6, dry or moist
- Texture: loam, clay loam, sandy loam, fine sandy loam
- Clay: 14 to 35 percent

Cambic horizon – the zone from 2 to 12 inches (Bw horizon).

Begay soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
Geomorphic position: occurs in moderately deep to very deep stable deposits on structural benches
Parent material: residuum weathered from sandstone and/or slope alluvium derived from sandstone and/or eolian sands
Slope: 1 to 5 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 40 percent
woody debris: 10 percent
bare soil: 46 percent
surface rock fragments
channer: 4 percent

Drainage class: somewhat excessively drained
Ksat solum: 0.57 to 19.98 inches per hour (4.00 to 141.00 micrometers per second)

Available water capacity total inches: 6.8 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: B
Present vegetation: broom snakeweed, cheatgrass, Douglas rabbitbrush, galleta, prickly pear, Russian thistle, sand buckwheat
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 18’ 7.70’’ north, 109° 31’ 21.40’’ west

A—0 to 2 inches (0 to 5 cm); reddish yellow (7.5YR 6/6) loamy fine sand, strong brown (7.5YR 4/6), moist; 8 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine and fine roots throughout; common fine irregular pores; strongly effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Bw—2 to 14 inches (5 to 36 cm); reddish brown (5YR 5/4) fine sandy loam, yellowish red (5YR 4/6), moist; 12 percent clay; moderate medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many medium, very fine, and fine roots throughout; common very fine dendritic tubular pores; strongly effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Bk—14 to 34 inches (36 to 86 cm); light brown (7.5YR 6/4) fine sandy loam, strong brown (7.5YR 5/6), moist; 13 percent clay; weak medium angular blocky structure; soft, friable, slightly sticky, nonplastic; common very fine and fine roots throughout; common fine dendritic tubular pores; few very fine carbonate masses; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Bkn—34 to 50 inches (86 to 127 cm); reddish yellow (7.5YR 6/6) sandy loam, strong brown (7.5YR 4/6), moist; 12 percent clay; moderate medium subangular blocky structure; very hard, very firm, slightly sticky, nonplastic; common very fine roots throughout; common fine tubular pores; few fine and common fine carbonate masses; violently effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt smooth boundary.

Cn—50 to 60 inches (127 to 152 cm); reddish yellow (7.5YR 5/6)fine sandy loam, strong brown (7.5YR 4/6), moist; 14 percent clay; massive; moderately hard, very friable, slightly sticky, nonplastic; common very fine roots throughout; common very fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.8; abrupt wavy boundary.

Range in Characteristics

Clay content of the control section (weighted average): 10 to 18 percent

A horizon
- Hue: 5YR, 7.5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: loamy sand, loamy fine sand, sandy loam
- Clay: 7 to 15 percent
- Reaction: moderately alkaline to strongly alkaline
- Calcium carbonate equivalent: 0 to 4 percent

Bw horizon
- Hue: 5YR, 7.5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: fine sandy loam, sandy loam
- Clay: 12 to 20 percent
- Reaction: moderately alkaline to strongly alkaline
- Calcium carbonate equivalent: 0 to 4 percent

Bk and Bkn horizons
- Hue: 5YR, 7.5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: fine sandy loam, sandy loam
- Clay: 12 to 32 percent
- Reaction: moderately alkaline to strongly alkaline
- Calcium carbonate equivalent: 0 to 4 percent

Cn horizon
- Hue: 5YR, 7.5YR
- Value: 5 to 8 dry, 4 to 7 moist
- Chroma: 3 to 6, dry or moist
- Texture: loamy coarse sand, loamy fine sand, sandy loam, fine sandy loam
- Clay: 5 to 30 percent
- Reaction: moderately alkaline to strongly alkaline
- Calcium carbonate equivalent: 0 to 4 percent
- Sodium adsorption ratio: 0 to 4

Cambic horizon – the zone from 2 to 34 inches (Bw and Bk horizons).

28—Marcou-Claysprings complex, 0 to 8 percent slopes

Map Unit Setting

Landform(s): dunes, fan remnants, pediments, terraces
Elevation: 5,300 to 5,900 feet (1,615 to 1,798 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.3 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Marcou and similar soils: 65 percent
Claysprings and similar soils: 20 percent
Minor Components: 15 percent
- Nakai and similar soils
- Needle and similar soils
- Notal and similar soils
- Sheppard and similar soils
- Gullied land
- Riverwash

Soil Properties and Qualities

Marcou soils
Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents
Geomorphic position: occurs on alluvial fans and fan remnants overlain by sand sheets and dunes
Parent material: eolian sands derived from sandstone over alluvium derived from sandstone
Slope: 0 to 8 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 20 percent
    woody debris: 0 percent
    bare soil: 70 percent
  surface rock fragments
    gravel: 10 percent

Drainage class: somewhat excessively drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

Available water capacity total inches: 6.0 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: rare
Runoff class: medium

Hydrologic group: A
Present vegetation: prickly Russian thistle, shadscale
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 32’ 51.50’’ north, 109° 24’ 39.80’’ west

C—0 to 3 inches (0 to 8 cm); yellowish red (5YR 4/6) fine sandy loam, reddish brown (5YR 4/4), moist; 12 percent clay; weak thin platy parts to weak medium granular structure; soft, very friable, nonsticky, nonplastic; common very fine roots throughout; common very fine tubular pores; 1 percent gravel; slightly effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Ckn1—3 to 25 inches (8 to 64 cm); yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6), moist; 14 percent clay; massive; hard, friable, slightly sticky, nonplastic; common very fine roots throughout; common very fine tubular pores; common fine and few fine carbonate masses; 5 percent gravel; strongly effervescent, 2 percent calcium carbonate equivalent; very strongly alkaline, pH 9.4; clear smooth boundary.

Ckn2—25 to 60 inches (64 to 152 cm); yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6), moist; 10 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine roots throughout; common fine carbonate masses; 5 percent gravel; strongly effervescent, 2 percent calcium carbonate equivalent; very strongly alkaline, pH 9.2.

Range in Characteristics

A horizons
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 6 moist
- Chroma: 4 to 6, dry or moist
- Texture: loamy sand, loamy fine sand, sandy loam, fine sandy loam, very fine sandy loam
- Clay: 2 to 14 percent
- Reaction: moderately alkaline to strongly alkaline
- Rock fragments: 0 to 5 percent

C horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 6 moist
- Chroma: 4 to 8, dry or moist
- Texture: coarse sand, loamy sand, sandy loam, fine sandy loam, very fine sandy loam
- Clay: 4 to 15 percent
- Reaction: moderately alkaline to strongly alkaline
- Calcium carbonate equivalent: 0 to 2 percent

Ckn horizons
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 6 moist
- Chroma: 4 to 8, dry or moist
- Texture: loamy sand, sandy loam, fine sandy loam, sandy clay loam
- Clay: 4 to 32 percent
- Reaction: moderately alkaline to very strongly alkaline
- Calcium carbonate equivalent: 0 to 4 percent
- Rock fragments: 0 to 5 percent

Some pedons do not have an A horizon.
Some pedons do not have a Ckn horizon.
Some pedons have a Cn horizon that is strongly alkaline.

Claysprings soils

Taxonomic classification: Clayey, mixed, superactive, calcareous, mesic, shallow Typic Torriorthents
Geomorphic position: occurs on pediments and eroded hills
Parent material: residuum weathered from sandstone and shale
Slope: 0 to 8 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 5 percent
  - woody debris: 0 percent
  - bare soil: 55 percent
- surface rock fragments
  - gravel: 20 percent
  - cobble: 15 percent
  - stone: 5 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, densic; 15 to 40 inches to bedrock, lithic
Drainage class: somewhat poorly drained
Ksat solum: 0.00 to 0.06 inches per hour (0.01 to 0.42 micrometers per second)
Ksat restrictive layer: 0.00 to 0.06 inches per hour (0.01 to 0.42 micrometers per second)

Available water capacity total inches: 1.9 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: rare
Runoff class: very high
Hydrologic group: D
Present vegetation: prickly Russian thistle, shadscale
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 35° 55’ 8.60” north, 109° 35’ 25.70” west

Cn1—0 to 1 inch (0 to 3 cm); red (2.5YR 5/6) clay, red (2.5YR 4/6), moist; 55 percent clay; massive; hard, friable, very sticky, very plastic; common very fine roots throughout; common medium irregular pores; violently effervescent; very strongly alkaline, pH 9.2; abrupt smooth boundary.

Cn2—1 to 8 inches (3 to 20 cm); red (2.5YR 5/6) clay, red (2.5YR 4/6), moist; 42 percent clay; massive; hard, friable, very sticky, very plastic; common very fine roots throughout; common medium and fine tubular pores; violently effervescent; very strongly alkaline, pH 9.2; clear smooth boundary.

Cn3—8 to 12 inches (20 to 30 cm); red (2.5YR 5/6) clay loam, dark red (2.5YR 3/6), moist; 38 percent clay; massive; moderately hard, very friable, moderately sticky, moderately plastic; common very fine roots throughout; common very fine and fine tubular pores; violently effervescent; strongly alkaline, pH 9.0; abrupt wavy boundary.

Cd—12 to 25 inches (30 to 64 cm); red (2.5YR 5/6) clay loam, dark red (2.5YR 3/6), moist; 30 percent clay; massive; rigid, rigid, moderately sticky, moderately plastic; few very fine roots in cracks; noneffervescent; strongly alkaline, pH 8.6; abrupt wavy boundary.

R—25 inches (64 cm); unweathered, fractured sandstone and shale bedrock.

Range in Characteristics

Claysprings as used in this survey is a taxadjunct to the series because it has a mixed mineralogy class and a superactive activity class. Claysprings series is a Clayey, smectitic, calcareous, mesic, shallow Typic Torriorthents.

Cn and Cd horizons
- Hue: 2.5YR, 5YR, 7.5YR, 10YR
- Value: 4 to 7 dry, 3 to 5 moist
- Chroma: 2 to 6, dry or moist
- Texture: clay loam, clay
- Clay: 30 to 60 percent
- Reaction: strongly alkaline to very strongly alkaline

Some pedons have a Cr horizon.

29—Moenkopie-Rock outcrop complex, severely eroded, 1 to 45 percent slopes

Map Unit Setting

Landform(s): escarpments, structural benches
Elevation: 5,200 to 5,950 feet (1,585 to 1,814 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Moenkopie and similar soils: 50 percent
Rock outcrop: 35 percent
Minor Components: 15 percent
- Marcou
- Sheppard
- Needle
- Riverwash
- Gullied land

Soil Properties and Qualities

Moenkopie soils
Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Torriorthents

Geomorphic position: occurs on structural benches and sideslopes of escarpments
Parent material: eolian sands derived from sandstone over residuum weathered from calcareous sandstone
Slope: 1 to 43 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 8 percent
woody debris: 1 percent
bare soil: 91 percent
surface rock fragments

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: moderately well drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 0.7 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: very rare
Runoff class: negligible
Hydrologic group: D
Present vegetation: broom snakeweed, Ephedra, fourwing saltbush, galleta, rabbitbrush, shadscale saltbush, spike dropseed
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 13’ 10.50’’ north, 109° 39’ 21.50’’ west

Cn1—0 to 1 inch (0 to 3 cm); reddish yellow (5YR 6/8) loamy sand, yellowish red (5YR 4/6), moist; 5 percent clay; single grain; loose, loose, nonsticky, nonplastic; irregular pores; violently effervescent; strongly alkaline, pH 8.8; abrupt wavy boundary.

2Cn2—1 to 7 inches (3 to 18 cm); yellowish red (5YR 5/8) sandy loam, yellowish red (5YR 4/6), moist; 12 percent clay; massive; slightly hard, very friable, slightly sticky, nonplastic; common fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.8; abrupt smooth boundary.

2R—7 inches (18 cm); unweathered, fractured sandstone bedrock.

Range in Characteristics

Clay content of the control section (weighted average): 10 to 18 percent

Cn horizons
Hue: 5YR, 7.5YR
Value: 4 to 6 dry or moist
Chroma: 6 to 8 dry or moist
Texture: loamy sand, loamy fine sand, sandy loam, fine sandy loam

Clay: 4 to 30 percent
Reaction: moderately alkaline to strongly alkaline

Rock outcrop
Slope: 1 to 45 percent

Range in Characteristics

Exposures of flat or rolling bedrock with small exposures of steep bedrock and cliffs, typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

30—Monue sandy clay loam, moderately deep, 0 to 3 percent slopes

Map Unit Setting

Landform(s): structural benches
Elevation: 5,500 to 5,600 feet (1,676 to 1,707 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Monue, moderately deep and similar soils: 95 percent
Minor Components: 5 percent
- Moderately deep soils similar to Nakai, Tewa, and Redhouse series
- Soils similar to Monue with finer textures in the control section

Soil Properties and Qualities

Monue, moderately deep soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids
Geomorphic position: occurs on structural benches
Parent material: alluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale
Slope: 0 to 3 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 2 percent
woody debris: 1 percent
bare soil: 82 percent
surface rock fragments
gravel: 15 percent

Depth to restrictive feature(s): 20 to 40 inches to bedrock, lithic
Drainage class: moderately well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)
Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 4.4 (low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: medium
Hydrologic group: C
Present vegetation: broom snakeweed, cottonwood, prickly Russian thistle
Land capability (non irrigated): 3c

Typical Profile

Location
Geographic Coordinate System: 36° 29’ 21.90’’ north, 109° 25’ 44.60’’ west

Ap—0 to 3 inches (0 to 8 cm); yellowish red (5YR 5/6) sandy clay loam, reddish brown (5YR 4/4), moist; 21 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; many very fine and fine roots throughout; many very fine and fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw—3 to 14 inches (8 to 36 cm); yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6), moist; 25 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common medium and very fine roots, and many fine roots throughout; common medium, very fine, and fine dendritic tubular pores; 2 percent gravel; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bkn1—14 to 26 inches (36 to 66 cm); reddish yellow (5YR 6/6) sandy loam, reddish brown (5YR 5/4), moist; 16 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common medium, very fine and fine roots throughout; common medium and fine dendritic tubular pores; common medium carbonate masses; 5 percent gravel; violently effervescent, 11 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear smooth boundary.

Bkn2—26 to 37 inches (66 to 94 cm); reddish yellow (5YR 6/6) sandy loam, yellowish red (5YR 4/6), moist; 18 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; moderately hard, friable, slightly sticky, nonplastic; common fine roots throughout; common very fine dendritic tubular pores; common medium and coarse carbonate masses; 12 percent gravel; violently effervescent, 9 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt wavy boundary.

R—37 inches (94 cm); unweathered, unfractured sandstone and shale bedrock.

Range in Characteristics

Monue family differs from the series because the depth to bedrock is 20 to 40 inches, while the Monue series is very deep.

Clay content of the control section (weighted average): 10 to 18 percent
Rock fragments of the control section: 0 to 5 percent

Ap horizon
Hue: 5YR
Value: 4 to 6 dry, 4 moist
Chroma: 4 to 6, dry or moist
Texture: fine sandy loam, sandy clay loam
Clay: 12 to 21 percent
Reaction: moderately alkaline to strongly alkaline

Bw horizon
Hue: 5YR
Value: 4 to 5 dry, 4 to 6 moist
Chroma: 4 to 6, dry or moist
Texture: fine sandy loam
Clay: 15 to 34 percent
Reaction: moderately alkaline to strongly alkaline

Bkn horizons
Hue: 5YR
Value: 4 to 6, dry or moist
Chroma: 4 to 6, dry or moist
Texture: sandy loam
Clay: 16 to 22 percent
Calcium carbonate equivalent: 5 to 15 percent (less than 5 percent visible)
Sodium adsorption ratio: 0 to 4

Cambic horizon – the zone from 3 to 37 inches (Bw and Bkn horizons).

31—Monue-Redhouse-Sheppard complex, 0 to 15 percent slopes

Map Unit Setting

Landform(s): fan remnants, valleys
Elevation: 5,800 to 6,400 feet (1,768 to 1,951 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to 13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to 15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Monue and similar soils: 55 percent
Redhouse and similar soils: 25 percent
Sheppard and similar soils: 15 percent
Minor Components: 5 percent
- Active dunes
- Gullied land
- Rock outcrop
- Monue and similar soils that have coarser textures in the particle size control section
- Redhouse and similar soils that have finer textures in the particle size control section

Soil Properties and Qualities

Monue soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids
Geomorphic position: occurs on broad, gently sloping valley sides and bottoms and on remnants of alluvial fans
Parent material: eolian sands derived from sandstone over slope alluvium derived from sandstone
Slope: 3 to 15 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 40 percent
woody debris: 5 percent
bare soil: 55 percent
surface rock fragments

Drainage class: somewhat excessively drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

Available water capacity total inches: 7.9 (high)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: A
Present vegetation: alkali sacaton, blue grama, broom snakeweed, fourwing saltbush, Indian ricegrass, prickly Russian thistle
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 35° 56’ 37.40’’ north, 109° 47’ 14.40’’ west

A—0 to 2 inches (0 to 5 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/6), moist; 5 percent clay; weak thick platy and weak very fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common medium roots and many fine roots throughout; common fine dendritic tubular and common fine irregular pores; strongly effervescent; moderately alkaline, pH 8.0; very abrupt wavy boundary.

BA—2 to 8 inches (5 to 20 cm); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6), moist; 6 percent clay; moderate coarse subangular blocky and moderate very thick platy structure; slightly hard, friable, nonsticky, nonplastic; few medium and common fine roots throughout; common fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bk—8 to 29 inches (20 to 74 cm); reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 5/6), moist; 9 percent clay; moderate very coarse subangular blocky structure; hard, friable, nonsticky, nonplastic; few fine roots throughout; common very fine and fine dendritic tubular pores; common fine carbonate masses; strongly

effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; gradual smooth boundary.

Ck—29 to 60 inches (74 to 152 cm); yellowish red (5YR 5/6) loamy very fine sand, yellowish red (5YR 4/6), moist; 8 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few fine roots throughout; common fine irregular pores; few fine carbonate masses; slightly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

Range in Characteristics

Clay content of the control section (weighted average): 8 to 18 percent

A horizon
- Hue: 5YR, 7.5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: fine sand, loamy fine sand, loamy very fine sand, very fine sandy loam
- Clay: 2 to 10 percent
- Reaction: slightly alkaline to moderately alkaline

BA horizon
- Hue: 5YR, 7.5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: fine sand, loamy fine sand, loamy very fine sand, very fine sandy loam
- Clay: 2 to 10 percent
- Reaction: slightly alkaline to moderately alkaline

Bk horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 4 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: loamy fine sand, loamy very fine sand, fine sandy loam, very fine sandy loam, loam
- Clay: 2 to 20 percent
- Reaction: slightly alkaline to strongly alkaline
- Calcium carbonate equivalent: 0 to 6 percent

Ck horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 4 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: loamy fine sand, loamy very fine sand, fine sandy loam, very fine sandy loam, loam
- Clay: 2 to 20 percent
- Reaction: slightly alkaline to strongly alkaline
- Calcium carbonate equivalent: 0 to 6 percent

Cambic horizon – the zone from 8 to 29 inches (Bk horizon).

Some pedons do not have a Bk horizon.
Some pedons have a Bw horizon.

Redhouse soils
Taxonomic classification: Fine-loamy, mixed, superactive, mesic Typic Haplocalcids
Geomorphic position: occurs on broad, gently sloping valley sides and bottoms and on remnants of alluvial fans

Parent material: eolian sands derived from sandstone over alluvium derived from sandstone
Slope: 0 to 10 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 45 percent
woody debris: 5 percent
bare soil: 48 percent
surface rock fragments
gravel: 2 percent

Drainage class: well drained
Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

Available water capacity total inches: 10.3 (very high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: B
Present vegetation: blue grama, broom snakeweed, fourwing saltbush, prickly Russian thistle
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 35° 56’ 30.70’’ north, 109° 47’ 31.00’’ west

A—0 to 4 inches (0 to 10 cm); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4), moist; 14 percent clay; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine roots and many fine roots throughout; common very fine and fine dendritic tubular pores; noneffervescent; slightly alkaline, pH 7.6; abrupt wavy boundary.

Bw—4 to 14 inches (10 to 36 cm); yellowish red (5YR 4/6) sandy clay loam, 5YR 3/6 (5YR 3/6), moist; 23 percent clay; moderate coarse subangular blocky and moderate medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine roots throughout; common medium and fine dendritic tubular pores; very slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

Bk1—14 to 29 inches (36 to 74 cm); reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4), moist; 28 percent clay; moderate coarse subangular blocky structure; extremely hard, firm, moderately sticky, moderately plastic; few fine roots throughout; many fine dendritic tubular pores; common fine and coarse carbonate masses; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk2—29 to 45 inches (74 to 114 cm); light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 4/4), moist; 23 percent clay; moderate coarse subangular blocky structure; extremely hard, friable, slightly sticky, slightly plastic; few fine roots throughout; common fine dendritic tubular pores; common fine carbonate masses;

violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual wavy boundary.

Bkn—45 to 60 inches (114 to 152 cm); light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4), moist; 23 percent clay; moderate coarse subangular blocky structure; extremely hard, friable, slightly sticky, slightly plastic; common fine irregular and common fine dendritic tubular pores; common coarse carbonate masses; violently effervescent, 22 percent calcium carbonate equivalent; strongly alkaline, pH 8.8.

Range in Characteristics

Clay content of the control section (weighted average): 18 to 35 percent

A horizon
- Hue: 5YR, 7.5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: loamy fine sand, fine sandy loam, very fine sandy loam, loam
- Clay: 2 to 15 percent
- Reaction: slightly alkaline to moderately alkaline

Bw horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: , loam, sandy clay loam, clay loam, clay
- Clay: 6 to 45 percent
- Reaction: slightly alkaline to strongly alkaline

Bk horizons
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 4 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: fine sandy loam, loam, sandy clay loam, clay loam, clay
- Clay: 6 to 45 percent
- Reaction: slightly alkaline to strongly alkaline
- Calcium carbonate equivalent: 0 to 15 percent

Bkn horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 4 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: loamy sand, loamy very fine sand, fine sandy loam, loam, sandy clay loam, clay loam, clay
- Clay: 4 to 45 percent
- Reaction: slightly alkaline to strongly alkaline
- Calcium carbonate equivalent: 15 to 22 percent
- Sodium adsorption ratio: 0 to 4

Cambic horizon – the zone from 4 to 14 inches (Bw).

Calcic horizon – the zone from 14 to 60 inches (Bk1, Bk2, and Bkn horizons).

Some pedons do not have a Bkn horizon.

Sheppard soils
Taxonomic classification: Mixed, mesic Typic Torripsamments
Geomorphic position: occurs on stabilized dunes and sandsheets
Parent material: eolian sands derived from sandstone over alluvium derived from sandstone

Slope: 0 to 15 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 35 percent
    woody debris: 2 percent
    bare soil: 48 percent
  surface rock fragments
    gravel: 15 percent

Drainage class: excessively drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

Available water capacity total inches: 6.0 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: A
Present vegetation: blue grama, broom snakeweed, fourwing saltbush, Indian ricegrass, prickly Russian thistle, Torrey Mormon tea, yucca
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 6’ 25.70” north, 109° 48’ 30.50” west

A—0 to 4 inches (0 to 10 cm); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4), moist; 3 percent clay; weak thin platy and moderate fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common medium roots, many very fine roots, and common fine roots throughout; many fine irregular pores; 5 percent gravel; slightly effervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

C1—4 to 14 inches (10 to 36 cm); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4), moist; 4 percent clay; massive; slightly hard, friable, slightly sticky, nonplastic; few medium and common fine roots throughout; many fine irregular pores; 1 percent gravel; slightly effervescent; slightly alkaline, pH 7.8; gradual wavy boundary.

C2—14 to 38 inches (36 to 97 cm); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4), moist; 4 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; few medium and common fine roots throughout; many fine irregular pores; 1 percent gravel; very slightly effervescent; moderately alkaline, pH 8.0; gradual wavy boundary.

C3—38 to 60 inches (97 to 152 cm); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4), moist; 3 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; few medium and fine roots throughout; many fine irregular pores; 2 percent gravel, 3 percent cobble, and 5 percent stone; very slightly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

A horizon
  Hue: 5YR, 7.5YR

Value: 5 to 7 dry, 4 to 5 moist
Chroma: 3 to 4, dry or moist
Texture: fine sand, loamy fine sand
Clay: 2 to 5 percent
Reaction: slightly alkaline to moderately alkaline
Rock fragments: 0 to 5 percent

C horizons
Hue: 5YR, 7.5YR
Value: 5 to 6 dry, 4 to 5 moist
Chroma: 4 to 6 dry, 3 to 4 moist
Texture: fine sand, very fine sand, loamy fine sand
Clay: 2 to 5 percent
Reaction: slightly alkaline to moderately alkaline
Rock fragments: 0 to 10 percent

32—Monue-Sheppard-Nakai complex, 1 to 6 percent slopes

Map Unit Setting

Landform(s): structural benches
Elevation: 5,600 to 6,100 feet (1,706 to 1,859 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Monue and similar soils: 40 percent
Sheppard and similar soils: 40 percent
Nakai and similar soils: 15 percent
Minor components: 5 percent
- Buried Cambids mantled by eolain sands sheets and similar soils
- Torriorthents
- Rock outcrop
- Monue and similar soils that have finer and coarser textures in the control section

Soil Properties and Qualities

Monue soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids
Geomorphic position: occurs on structural benches and cuestas
Parent material: residuum weathered from sandstone and eolian deposits derived from sandstone
Slope: 1 to 5 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent

Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 30 percent
woody debris: 5 percent
bare soil: 65 percent
surface rock fragments

Drainage class: excessively drained
Ksat solum: 0.57 to 19.98 inches per hour (4.00 to 141.00 micrometers per second)

Available water capacity total inches: 7.7 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: B
Present vegetation: blue grama, galleta, Indian ricegrass, prickly Russian thistle, prickly pear, snakeweed
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 9’ 8.06’’ north, 109° 38’ 36.40’’ west

A—0 to 3 inches (0 to 8 cm); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6), moist; 8 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine roots throughout; interstitial pores; strongly effervescent; moderately alkaline, pH 8.2; gradual smooth boundary.

Bw1—3 to 18 inches (8 to 46 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 10 percent clay; weak coarse angular blocky and weak medium angular blocky structure; slightly hard, friable, nonsticky, nonplastic; common very fine roots and few fine roots throughout; common very fine and fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.6; gradual smooth boundary.

Bw2—18 to 34 inches (46 to 86 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 14 percent clay; weak coarse subangular blocky and weak medium subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; few very fine roots and fine roots throughout; common very fine and fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.6; gradual smooth boundary.

Bkn—34 to 48 inches (86 to 122 cm); reddish yellow (5YR 6/6) sandy clay loam, gray (5YR 5/1), moist; 22 percent clay; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; common very fine and fine tubular pores; few fine carbonate masses; 5 percent gravel; violently effervescent, 5 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; gradual wavy boundary.

Bwn—48 to 60 inches (122 to 152 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 12 percent clay; weak medium subangular blocky and weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots throughout; few very fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.8.

Range in Characteristics

Clay content of the control section (weighted average): 5 to 18 percent

A horizon
- Hue: 7.5YR, 5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: fine sand, loamy sand, loamy fine sand, sandy loam
- Clay: 10 to 18 percent

Bw horizons
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 3 to 6, dry or moist
- Texture: fine sandy loam, sandy loam
- Clay: 8 to 16 percent
- Reaction: moderately alkaline to strongly alkaline

Bkn horizon
- Hue: 7.5YR, 5YR
- Value: 5 to 7 dry, 4 to 6 moist
- Chroma: 2 to 6, dry or moist
- Texture: sandy loam, loam
- Clay: 8 to 18 percent
- Calcium carbonate equivalent: 1 to 10 percent

Bwn horizon
- Hue: 7.5YR, 5YR
- Value: 5 to 7 dry, 4 to 6 moist
- Chroma: 2 to 6, dry or moist
- Texture: fine sandy loam, , sandy loam, loam,
- Clay: 5 to 18 percent
- Sodium adsorption ratio: 1 to 4

Cambic horizon – the zone from 3 to 34 inches (Bw horizons).

Sheppard soils
Taxonomic classification: Mixed, mesic Typic Torripsamments
Geomorphic position: sand sheet and longitudinal dunes occur on cuestas
Parent material: eolian sands derived from sandstone
Slope: 1 to 5 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 20 percent
  - woody debris: 10 percent
  - bare soil: 70 percent
- surface rock fragments

Drainage class: excessively drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity total inches: 3.6 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none

Runoff class: low
Hydrologic group: A
Present vegetation: blue grama, Cutler Mormon tea, galleta, Indian ricegrass, narrow leaf yucca, prickly Russian thistle, prickly pear, sandhill muhly, snakeweed
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 9’ 31.30’’ north, 109° 40’ 3.90’’ west

C1—0 to 2 inches (0 to 5 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 4 percent clay; single grain; loose, loose, nonsticky, nonplastic; few very fine and fine roots throughout; common fine irregular pores; noneffervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

C2—2 to 30 inches (5 to 76 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 4 percent clay; massive; soft, loose, nonsticky, nonplastic; few fine roots throughout; common fine irregular pores; slightly effervescent; moderately alkaline, pH 8.4; gradual wavy boundary.

C3—30 to 60 inches (76 to 152 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots throughout; common fine irregular pores; strongly effervescent; strongly alkaline, pH 8.6.

Range in Characteristics

C horizons
- Hue: 7.5YR, 5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 4 to 8, dry or moist
- Texture: sand, fine sand, loamy sand, loamy fine sand
- Clay: 2 to 7 percent

Nakai soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocalcids
Geomorphic position: occurs on structural benches and cuestas
Parent material: eolian deposits derived from sandstone and shale and/or residuum weathered from calcareous sandstone
Slope: 2 to 6 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 30 percent
  - woody debris: 10 percent
  - bare soil: 60 percent
- surface rock fragments

Depth to restrictive feature(s): 40 to 60 inches to bedrock, paralithic; 40 to 60 inches to bedrock, lithic
Drainage class: excessively drained

Ksat solum: 0.57 to 19.98 inches per hour (4.00 to 141.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 4.1 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: B
Present vegetation: blue grama, broom snakeweed, galleta, Indian ricegrass, prickly Russian thistle, prickly pear, spike dropseed
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 9’ 0.00’’ north, 109° 38’ 20.10’’ west

A—0 to 3 inches (0 to 8 cm); strong brown (7.5YR 5/6) loamy very fine sand, strong brown (7.5YR 4/6), moist; 8 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine and fine roots throughout; interstitial pores; strongly effervescent; moderately alkaline, pH 8.4; gradual wavy boundary.

Bk—3 to 20 inches (8 to 51 cm); 1 percent white (10YR 8/1) and 99 percent reddish yellow (7.5YR 6/6) sandy loam, 1 percent light gray (10YR 7/1) and 99 percent strong brown (7.5YR 5/6), moist; 15 percent clay; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots throughout; common very fine and fine dendritic tubular pores; few fine carbonate masses; 5 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt wavy boundary.

Bkn—20 to 41 inches (51 to 104 cm); 40 percent pink (7.5YR 7/4) and 60 percent white (10YR 8/1) very gravelly sandy loam, 40 percent light brown (7.5YR 6/4) and 60 percent light gray (10YR 7/1), moist; 15 percent clay; weak medium subangular blocky and weak fine subangular blocky structure; very hard, very firm, slightly sticky, nonplastic; few very fine roots throughout; few very fine dendritic tubular pores; few fine carbonate masses and common medium carbonate nodules; 40 percent gravel; violently effervescent, 36 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt wavy boundary.

Cr—41 to 50 inches (104 to 127 cm)

R—50 inches (127 cm)

Range in Characteristics

A horizon
- Hue: 7.5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: fine sand, loamy very fine sand, fine sandy loam
- Clay: 4 to 8 percent

Bk horizon
- Hue: 5YR, 7.5YR, 10YR
- Value: 5 to 8, dry or moist
- Chroma: 1 to 6, dry or moist
- Texture: loamy sand, fine sandy loam, sandy loam

Clay: 8 to 18 percent
Calcium carbonate equivalent: 0 to 4 percent

Bkn horizon
Hue: 10YR, 7.5YR, 5YR
Value: 6 to 8 dry, 5 to 7 moist
Chroma: 1 or 4, dry or moist
Texture: loamy fine sand, sandy loam
Clay: 12 to 18 percent
Reaction: moderately alkaline to strongly alkaline
Calcium carbonate equivalent: 25 to 36 percent
Rock fragments: 0 to 40 percent

Calcic horizon-the zone from 20 to 41 inches (Bkn horizon).

33—Nakai very fine sandy loam, 0 to 6 percent slopes

Map Unit Setting

Landform(s): terraces
Elevation: 5,200 to 5,600 feet (1,585 to 1,706 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Nakai and similar soils: 90 percent
Minor Components: 10 percent
- Monue and similar soils
- Sheppard and similar soils
- Redhouse and similar soils
- Notal and similar soils
- Tewa and similar soils
- Soils similar to Nakai with finer textures in the control section

Soil Properties and Qualities

Nakai soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocalcids
Geomorphic position: Soils derived from fine sand stone alluvium and eolain deposits on relic stream terraces.
Parent material: eolian deposits derived from sandstone over alluvium derived from shale
Slope: 0 to 2 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent

Physical cover
canopy plant cover: 25 percent
woody debris: 0 percent
bare soil: 60 percent
surface rock fragments
fine gravel: 15 percent

Drainage class: well drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

Available water capacity total inches: 6.8 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: A
Present vegetation: fourwing saltbush, prickly Russian thistle
Land capability (non irrigated): 1

Typical Profile

Location
Geographic Coordinate System: 36° 29’ 56.40’’ north, 109° 28’ 26.60’’ west

Ap—0 to 6 inches (0 to 15 cm); yellowish red (5YR 5/8) very fine sandy loam, yellowish red (5YR 4/6), moist; 15 percent clay; weak fine subangular blocky and moderate medium subangular blocky structure; soft, friable, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine and many fine irregular pores; 1 percent fine gravel; violently effervescent; strongly alkaline, pH 8.5; abrupt smooth boundary.

Bw—6 to 31 inches (15 to 79 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 14 percent clay; moderate coarse subangular blocky structure; soft, friable, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

Bk1—31 to 43 inches (79 to 109 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 12 percent clay; moderate medium subangular blocky parts to moderate fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common very fine roots throughout; common medium and many fine dendritic tubular pores; common fine salt masses and common medium carbonate masses; violently effervescent, 7 percent calcium carbonate equivalent; strongly alkaline, pH 8.9; clear smooth boundary.

Bk2—43 to 60 inches (109 to 152 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 14 percent clay; moderate coarse subangular blocky structure; hard, friable, slightly sticky, nonplastic; few fine roots throughout; common very fine dendritic tubular pores; common medium and coarse carbonate masses; violently effervescent, 8 percent calcium carbonate equivalent; very strongly alkaline, pH 9.1.

Range in Characteristics

Clay content of the control section (weighted average): 10 to 18 percent

Ap horizon
Hue: 5YR, 7.5YR, 2.5YR
Value: 4 to 8 dry, 4 to 6 moist
Chroma: 3 to8, dry or moist

Texture: very fine sandy loam, fine sandy loam, sandy loam, sandy clay loam
Clay: 4 to 24 percent

Bw horizon
Hue: 5YR, 7.5YR, 2.5YR
Value: 4 to 5 dry, 3 to 4 moist
Chroma: 3 to 6, dry or moist
Texture: very fine sandy loam, fine sandy loam,
Clay: 7 to 20 percent
Reaction: moderately alkaline to strongly alkaline

Bk horizons
Hue: 5YR, 7.5YR, 2.5YR
Value: 4 to 7 dry, 3 to 5 moist
Chroma: 3 to 6, dry or moist
Texture: loamy sand, very fine sandy loam, gravelly sandy loam, fine sandy loam
Clay: 4 to 18 percent
Reaction: moderately alkaline to very strongly alkaline
Calcium carbonate equivalent: 5 to 15 percent

Cambic horizon – the zone from 6 to 31 inches (Bw horizon).

Calcic horizon – the zone from 31 to 60 inches (Bk horizons).

34—Nakai-Somorent family complex, 1 to 15 percent slopes

Map Unit Setting

Landform(s): structural benches
Elevation: 5,200 to 5,800 feet (1,585 to 1,768 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 1 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Nakai and similar soils: 60 percent
Somorent family and similar soils: 25 percent
Minor Components: 15 percent
- Aneth and similar soils
- Marcou and similar soils
- Sheppard and similar soils
- Active dunes and sand sheets
- Gullied land
- Rock outcrop

Soil Properties and Qualities

Nakai soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocalcids
Geomorphic position: occurs on structural benches
Parent material: residuum weathered from cherty limestone and/or eolian sands derived from sandstone

Slope: 1 to 8 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 35 percent
    woody debris: 1 percent
    bare soil: 64 percent
  surface rock fragments

Depth to restrictive feature(s): 40 to 60 inches to bedrock, lithic
Drainage class: somewhat excessively drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 0.57 inches per hour (1.40 to 4.00 micrometers per second)

Available water capacity total inches: 3.6 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: C
Present vegetation: blue grama, broom snakeweed, galleta grass, longleaf Mormon tea, prickly Russian thistle, prickly pear
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 35’ 29.90’’ north, 109° 25’ 24.50’’ west

A—0 to 3 inches (0 to 8 cm); reddish yellow (5YR 6/6) loamy very fine sand, yellowish red (5YR 4/6), moist; 5 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many medium roots, common coarse roots, and many very fine and fine roots throughout; many fine irregular pores; 3 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bw—3 to 10 inches (8 to 25 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 12 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many medium roots, many very fine and fine roots throughout; common very fine and fine dendritic tubular pores; 4 percent gravel; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk—10 to 15 inches (25 to 38 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 14 percent clay; moderate medium subangular blocky structure; soft, friable, slightly sticky, nonplastic; common medium roots and many very fine and fine roots throughout; common very fine and fine dendritic tubular pores; common coarse carbonate masses; 5 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bkn—15 to 24 inches (38 to 61 cm); reddish yellow (7.5YR 7/6) sandy loam, pink (7.5YR 7/4), moist; 13 percent clay; moderate fine subangular blocky and moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common medium roots and many very fine and fine roots throughout; many fine

irregular and many fine dendritic tubular pores; 8 percent gravel; violently effervescent, 36 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt wavy boundary.

Bkknm—24 to 25 inches (61 to 64 cm); pinkish white (7.5YR 8/2) gravelly loamy coarse sand, pink (7.5YR 7/3), moist; 10 percent clay; strong very thick platy structure; rigid, rigid, nonsticky, nonplastic; many medium, very fine, and fine roots top of horizon; common coarse carbonate concretions; 30 percent gravel; violently effervescent, 50 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt smooth boundary.

Bkkn—25 to 55 inches (64 to 140 cm); pinkish white (7.5YR 8/2) gravelly loamy coarse sand, pink (7.5YR 7/3), moist; 8 percent clay; moderate fine subangular blocky and weak thin platy and moderate medium subangular blocky structure; extremely hard, slightly rigid, nonsticky, nonplastic; common fine roots throughout; common coarse carbonate concretions; 25 percent gravel; violently effervescent, 45 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt smooth boundary.

R—55 inches (140 cm); unweathered, unfractured limestone bedrock.

Range in Characteristics

Rock fragments in the control section: 0 to 30 percent

A horizon
- Hue: 5YR
- Value: 4 to 6 dry or moist
- Chroma: 4 to 6 dry or moist
- Texture: loamy fine sand, loamy very fine sand, sandy loam, fine sandy loam
- Clay: 5 to 10 percent

Bw horizon
- Hue: 5YR
- Value: 4 to 6, dry or moist
- Texture: loamy coarse sand, coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam
- Clay: 4 to 22 percent
- Reaction: moderately alkaline to strongly alkaline

Bk and Bkn horizons
- Hue: 5YR, 7.5YR
- Value: 5 to 7 dry, 4 to 7 moist
- Chroma: 4 to 6, dry or moist
- Texture: loamy coarse sand, coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam
- Clay: 4 to 22 percent
- Reaction: moderately alkaline to strongly alkaline
- Calcium carbonate equivalent: 10 to 40 percent

Bkknm horizon
- Hue: 5YR, 7.5YR
- Value: 6 to 8, dry or moist
- Chroma: 1 to 6, dry or moist
- Texture: coarse sand, loamy coarse sand, coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam
- Clay: 4 to 22 percent
- Reaction: moderately alkaline to strongly alkaline
- Calcium carbonate equivalent: 20 to 50 percent
- Cemented: calcium carbonate

Hardness: extremely hard to indurated
Thickness: 1 to 3 inches, discontinuous

Bkkn horizon
Hue: 5YR, 7.5YR
Value: 6 to 8, dry or moist
Chroma: 1 to 6, dry or moist
Texture: coarse sand, loamy coarse sand, coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam
Clay: 4 to 22 percent
Reaction: moderately alkaline to strongly alkaline
Calcium carbonate equivalent: 20 to 50 percent

Cambic horizon – the zone from 3 to 10 inches (Bw horizon).

Calcic horizon – the zone from 10 to 55 inches (Bk, Bkn, Bkknm, and Bkk horizons).

Some pedons do not have a Bw horizon.
Some pedons do not have an R horizon.
Some pedons have a Bw horizon that does not meet the requirements of a cambic diagnostic horizon because of coarse textures (loamy sands).

Somorent family soils
Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Typic Torriorthents
Geomorphic position: occurs on structural benches and low relief eroded hills
Parent material: residuum weathered from cherty limestone and/or eolian sands derived from sandstone
Slope: 1 to 15 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 30 percent
woody debris: 10 percent
bare soil: 58 percent
surface rock fragments
gravel: 2 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, paralithic; 15 to 40 inches to bedrock, lithic
Drainage class: moderately well drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 1.8 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: D
Present vegetation: broom snakeweed, Cutler Mormon tea
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 35’ 7.40” north, 109° 24’ 32.90” west

A—0 to 2 inches (0 to 5 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/6), moist; 4 percent clay; weak thin platy structure; loose, loose, nonsticky, nonplastic; few very fine and fine roots throughout; common fine irregular pores; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

C—2 to 15 inches (5 to 38 cm); reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 5/6), moist; 14 percent clay; massive; soft, very friable, moderately sticky, nonplastic; common medium roots, few very fine and common fine roots throughout; few fine irregular and common fine dendritic tubular pores; 5 percent gravel; violently effervescent; strongly alkaline, pH 8.5; abrupt smooth boundary.

2Cr—15 to 24 inches (38 to 61 cm); weathered, fractured limestone bedrock; abrupt wavy boundary.

2R—24 inches (61 cm); unweathered, unfractured limestone bedrock.

Range in Characteristics

Somorent family differs from the series because the series does not have hues of 5YR, a lithic contact within 15 to 40 inches, clay content of 4 to 28 percent, or local residuum derived from Chinle formation limestone.

A horizon
- Hue: 5YR, 7.5YR
- Value: 5 to 7 dry, 3 to 6 moist
- Chroma: 4 to 6, dry or moist
- Texture: loamy fine sand, sandy loam, fine sandy loam
- Clay: 4 to 14 percent
- Reaction: moderately alkaline to strongly alkaline

C horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 6 moist
- Chroma: 4 to 6, dry or moist
- Texture: loamy sand, coarse sandy loam, sandy loam, fine sandy loam, loam
- Clay: 4 to 28 percent
- Reaction: moderately alkaline to strongly alkaline

Some pedons have a Cn horizon that is strongly alkaline.

35—Nazlini loam, 0 to 3 percent slopes

Map Unit Setting

Landform(s): valley floors
Elevation: 5,200 to 5,500 feet (1,585 to 1,676 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Nazlini and similar soils: 90 percent
Minor Components: 10 percent
- Tezinie and similar soils
- Urban land

Soil Properties and Qualities

Nazlini soils
Taxonomic classification: Coarse-silty, mixed, superactive, calcareous, mesic Typic Torrifluvents
Geomorphic position: occurs on stream terraces and floodplain steps
Parent material: alluvium derived from sandstone and shale
Slope: 0 to 3 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 5 percent
woody debris: 0 percent
bare soil: 95 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 9.3 (high)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: rare
Runoff class: medium
Hydrologic group: C
Present vegetation: corn, greasewood, salt cedar
Land capability (irrigated): 2c

Typical Profile

Location
Geographic Coordinate System: 36° 13’ 56.10’’ north, 109° 36’ 6.80’’ west

Anp—0 to 15 inches (0 to 38 cm); yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6), moist; 13 percent clay; massive and moderate coarse subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common medium and fine roots throughout; common very fine tubular pores; strongly effervescent; strongly alkaline, pH 9.0; abrupt smooth boundary.

Cn1—15 to 23 inches (38 to 58 cm); yellowish red (5YR 5/6) silt, yellowish red (5YR 4/6), moist; 7 percent clay; weak medium subangular blocky and moderate thick platy structure; soft, very friable, moderately sticky, moderately plastic; common medium and fine roots throughout; common very fine tubular pores; slightly effervescent; very strongly alkaline, pH 9.8; abrupt smooth boundary.

Cn2—23 to 27 inches (58 to 69 cm); yellowish red (5YR 5/6) silt loam, yellowish red (5YR 4/6), moist; 21 percent clay; weak medium subangular blocky and weak

thin platy structure; slightly hard, friable, very sticky, very plastic; common fine roots throughout; common very fine tubular pores; strongly effervescent; very strongly alkaline, pH 9.7; clear smooth boundary.

Cn3—27 to 60 inches (69 to 152 cm); yellowish red (5YR 5/6) very fine sandy loam, reddish brown (5YR 4/4), moist; 5 percent clay; massive; soft, friable, nonsticky, nonplastic; common fine roots throughout; common interstitial and common very fine tubular pores; very slightly effervescent; very strongly alkaline, pH 10.0.

Range in Characteristics

Clay content of the control section (weighted average): 7 to 18 percent

Anp horizons
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: very fine sandy loam, loam, silt loam, sandy clay loam, clay loam
- Clay: 4 to 35 percent
- Reaction: moderately alkaline to very strongly alkaline
- Sodium adsorption ratio: 30 to 50

Cn horizons
- Hue: 5YR
- Value: 3 to 6 dry, 3 to 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: very fine sandy loam, loamy fine sand, clay, loamy sand, silt loam, silt, stratified fine sandy loam and clay and loam, stratified fine sand and very fine sandy loam
- Clay: 4 to 50 percent
- Reaction: strongly alkaline to very strongly alkaline
- Sodium adsorption ratio: 50 to 120

36—Oxyaquic Haplustolls-Riverwash complex, 1 to 4 percent slopes

Map Unit Setting

Landform(s): stream terraces
Elevation: 7,000 to 8,100 feet (2,134 to 2,469 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (7.8 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (8.9 to 11.1 degrees C)
Frost-free period: 120 to150 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-6AZ Colorado Plateau Pinyon-Juniper Sagebrush

Map Unit Composition

Oxyaquic Haplustolls and similar soils: 75 percent
Riverwash: 15 percent
Minor Components: 10 percent
- Ustifluvents
- Gullied land
- Rock outcrop
- Water

Soil Properties and Qualities

Oxyaquic Haplustolls soils
Taxonomic classification: Oxyaquic Haplustolls
Geomorphic position: occurs on stream terraces and flood plains adjacent to active stream and river channels.
Parent material: alluvium derived from sandstone and shale
Slope: 1 to 4 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 90 percent
woody debris: 10 percent
bare soil: 0 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 9.0 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: very rare
Seasonal water table minimum depth: about 20 to 40 inches
Runoff class: medium
Hydrologic group: C/D
Present vegetation: blue grama, Canada thistle, cheatgrass, Goodding's willow, needlepod rush, ponderosa pine, rubber rabbitbrush, Russian olive, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 16' 42.30'' north, 109° 11' 28.50'' west

A—0 to 10 inches (0 to 25 cm); brown (7.5YR 4/2) loam, dark brown (7.5YR 3/3), moist; 11 percent clay; moderate fine and moderate medium subangular blocky and moderate thin platy structure; moderately hard, firm, moderately sticky, moderately plastic; common medium, very fine and fine roots throughout; common very fine and fine tubular pores; slightly effervescent; neutral, pH 7.2; abrupt smooth boundary.

C1—10 to 18 inches (25 to 46 cm); brown (7.5YR 5/3) loamy fine sand, brown (7.5YR 4/3), moist; 7 percent clay; massive; soft, friable, nonsticky, nonplastic; common medium roots, very fine, and fine roots throughout; common very fine irregular pores; 5 percent fine distinct reddish yellow (7.5YR 6/8), moist, and yellowish red (5YR 5/6), moist, iron-manganese concretions with clear boundaries in matrix; slightly effervescent; neutral, pH 7.2; abrupt smooth boundary.

C2—18 to 50 inches (46 to 127 cm); brown (7.5YR 5/3) loam, dark brown (7.5YR 3/3), moist; 16 percent clay; moderate fine and moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common medium, very fine, and fine roots throughout; common very fine tubular pores; 10 percent fine distinct

reddish yellow (7.5YR 6/8), moist, and yellowish red (5YR 5/6), moist, iron-manganese concretions with clear boundaries in matrix; slightly effervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

Cg—50 to 60 inches (127 to 152 cm); pinkish gray (7.5YR 6/2) sand, brown (7.5YR 4/3), moist; 1 percent clay; massive; soft, friable, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine irregular pores; 5 percent fine distinct reddish yellow (7.5YR 6/8), moist, and yellowish red (5YR 5/6), moist, iron-manganese concretions with clear boundaries in matrix; noneffervescent; neutral, pH 7.2.

Range in Characteristics

Oxyaquic Haplustolls have soil properties that vary greater than family class limits.

A horizon
- Hue: 5YR, 7.5YR, 10YR
- Value: 3 to 5 dry, 2 to 3 moist
- Chroma: 1 to 3 dry or moist
- Texture: fine sand, loamy sand, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, sandy clay loam, clay loam
- Clay: 3 to 30 percent
- Reaction: neutral to moderately alkaline

C horizons
- Hue: 5YR, 7.5YR, 10YR
- Value: 3 to 6 dry, 2 to 5 moist
- Chroma: 2 to 6 dry or moist
- Texture: coarse sand, sand, fine sand, loamy sand, loamy fine sand, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, sandy clay loam, clay loam, silty clay loam
- Clay: 3 to 34 percent
- Reaction: neutral to moderately alkaline

Cg horizon
- Hue: 5YR, 7.5YR, 10YR
- Value: 3 to 5 dry or moist
- Chroma: 1 to 3 dry or moist
- Texture: coarse sand, sand, fine sand, loamy sand, fine sandy loam, very fine sandy loam, silt loam
- Clay: 1 to 12 percent
- Reaction: neutral to moderately alkaline

Aquic soil conditions – the zone from 50 to 60 inches (Cg horizon).

Riverwash
Slope: 1 to 2 percent

Range in Characteristics

Moderately deep to very deep, excessively drained and stratified materials consisting of unstabilized sandy, silty, clayey, and or gravelly sediment that is part of a dynamic inter-braided system of bars and channels. This material is not stable and is subject to shifting and sorting. It is usually dry but can be transformed into a temporary watercourse or a short-lived torrent after large amounts of precipitation or excessive runoff within the watershed. Vegetation is usually not supported because of the constant scouring and shifting of sediments.

Stream Segment Properties and Qualities

Segment

Length: approximately 11.5 miles of Tsaile Creek, 11 miles of Wheatfields Creek, and 5 miles of Whiskey Creek, located near the towns of Tsaile and Wheatfields
Stream width: 5 to 25 feet
Depth: 1 to 3 feet
Annual stream flow:
Stream flow data not available
Elevation:
Upper: 7,025 feet
Lower: 8,040 feet

Hydrology
Stream flow regimen: stream flow regulated by Wheatfields lake, upstream diversions for irrigation, livestock tanks, domestic use, and winter snowpack and melting
Active flood plain width: 50 to 1,100 feet
Flooding hazard: rare to very rare, very brief to extremely brief
Flooding month: January, February, May, June, October, November, and December
Seasonal water table minimum depth: 20 to 40 inches

Morphology
Average active channel width: 15 feet
Channel composition:
Bedrock: 5 percent
Cobbles: 0 percent
Gravel: 10 percent
Sand: 45 percent
Silt and Clay: 40 percent
Bank type:
Cut: 65 percent
Uncut: 35 percent
Vertical cut: 1 foot to 10 feet; averages 2 to 5 feet
Soils adjacent to Creek channels:
Oxyaquic Haplustolls, Parkalei, Techzuni,Tsaile, and Ustifluvents
Depositional bar features: dynamic system of inter-braided bars and channels that have the potential to relocate with each major flood event
Meander pattern: irregular meander
Stability: dynamic system of inter-braided components that aggrades and degrades

37—Pachic Haplustolls, 2 to 5 percent slopes

Map Unit Setting

Landform(s): terraces
Elevation: 7,300 to 7,400 feet (2,225 to 2,255 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (7.8 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (8.9 to 11.1 degrees C)
Frost-free period: 120 to 150 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-6AZ Colorado Plateau Pinyon-Juniper Sagebrush

Map Unit Composition

Pachic Haplustolls and similar soils: 80 percent
Minor Components: 20 percent
- Tsaile soils and similar
- Whiskey soils and similar

Soil Properties and Qualities

Pachic Haplustolls soils
Taxonomic classification: Pachic Haplustolls
Geomorphic position: Occurs on mesa relic alluvial terrace treads.
Parent material: eolian deposits derived from sandstone and/or alluvium derived from sandstone
Slope: 2 to 5 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 10 percent
woody debris: 0 percent
bare soil: 90 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 6.9 (moderate)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: medium
Hydrologic group: C
Present vegetation: alkali cordgrass, broom snakeweed, cheatgrass, prickly Russian thistle, rubber rabbitbrush
Land capability (non irrigated): 2c

Typical Profile

Location
Geographic Coordinate System: 36° 14’ 3.90’’ north, 109° 6’ 49.60’’ west

Ap—0 to 20 inches (0 to 51 cm); very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2), moist; 11 percent clay; weak very coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common medium, very fine, and fine roots throughout; common medium, very fine, and fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bt—20 to 32 inches (51 to 81 cm); 30 percent very dark brown (10YR 2/2) and 70 percent very dark gray (10YR 3/1) clay, 30 percent very dark grayish brown (10YR 3/2) and 70 percentblack (10YR 2/1), moist; 42 percent clay; weak fine prismatic parts to weak fine subangular blocky structure; hard, firm, moderately sticky, very plastic; common very fine to medium roots throughout; common very fine and fine dendritic tubular pores; common prominent clay films throughout and common prominent pressure faces throughout; noneffervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

Ck—32 to 60 inches (81 to 152 cm); 3 percent white (7.5YR 8/1) and 97 percent light brown (7.5YR 6/3) fine sandy loam, 3 percent light gray (7.5YR 7/1) and 97 percent brown (7.5YR 5/3), moist; 14 percent clay; massive; soft, very friable, nonsticky, nonplastic; common fine and medium roots throughout; common very fine and fine

dendritic tubular pores; common medium carbonate masses; slightly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

Range in Characteristics

Pachic Haplustolls have soil properties that vary greater than family class limits.

Ap horizon
- Hue: 7.5YR, 10YR
- Value: 3 to 4 dry, 2 to 3 moist
- Chroma: 2 to 4 dry, 2 to 3 moist
- Texture: fine sandy loam, very fine sandy loam, loam, sandy clay loam
- Clay: 10 to 26 percent
- Reaction: slightly alkaline to moderately alkaline

Bt horizon
- Hue: 5YR, 7.5YR, 10YR
- Value: 2 to 5 dry,2 to 4 moist
- Chroma: 1 to 6 dry, 1 to 4 moist
- Texture: sandy clay loam, clay loam, sandy clay, clay
- Clay: 30 to 45 percent
- Reaction: slightly alkaline to moderately alkaline

Ck horizon
- Value: 4 to 6 dry, 4 to 5 moist
- Chroma: 3 to 6, dry to moist
- Texture: fine sandy loam, sandy clay loam
- Clay: 12 to 33 percent
- Reaction: slightly alkaline or moderately alkaline
- Calcium carbonate equivalent: 0 to 6 percent (carbonates are geogenic and non-diagnostic)

Mollic epipedon – the zone from 0 to 20 inches (Ap horizon).

Argillic horizon – zone from 20 to 32 inches (Bt horizon).

38—Pack clay loam, 1 to 3 percent slopes

Map Unit Setting

Landform(s): terraces
Elevation: 7,200 to 7,500 feet (2,195 to 2,286 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (7.8 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (8.9 to 11.1 degrees C)
Frost-free period: 120 to 150 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush-Grasslands

Map Unit Composition

Pack and similar soils: 85 percent
Minor Components: 15 percent
- Bluewater soils
- Sandy Aridic Haplustolls
- Similar soils to Pack with finer and coarser textures in the particle size control section

Soil Properties and Qualities

Pack soils
Taxonomic classification: Fine-loamy, mixed, superactive, mesic Cumulic Haplustolls
Geomorphic position: occurs on stream terraces
Parent material: alluvium derived from sandstone and siltstone
Slope: 1 to 3 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 70 percent
    woody debris: 0 percent
    bare soil: 30 percent
  surface rock fragments

Drainage class: somewhat poorly drained
Ksat solum: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 9.7 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Seasonal water table minimum depth: 36 to 48 inches
Runoff class: medium
Hydrologic group: B
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 12’ 7.00’’ north, 109° 7’ 32.30’’ west

Ap1—0 to 7 inches (0 to 18 cm); brown (7.5YR 4/3) clay loam, dark brown (7.5YR 3/3), moist; 35 percent clay; strong coarse subangular blocky parts to moderate fine granular structure; slightly hard, friable, moderately sticky, moderately plastic; common medium, very fine, and fine roots throughout; common medium, very fine, and fine dendritic tubular pores; noneffervescent; slightly alkaline, pH 7.8; clear wavy boundary.

Ap2—7 to 21 inches (18 to 53 cm); brown (7.5YR 4/3) fine sandy loam, dark brown (7.5YR 3/3), moist; 12 percent clay; weak coarse prismatic parts to moderate coarse subangular blocky structure; moderately hard, firm, nonsticky, nonplastic; common medium, very fine, and fine roots throughout; common medium, very fine, and fine dendritic tubular pores; common fine carbonate masses; very slightly effervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

C—21 to 41 inches (53 to 104 cm); brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4), moist; 24 percent clay; massive; slightly hard, very friable, slightly sticky, moderately plastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Ck1—41 to 47 inches (104 to 119 cm); 50 percent reddish brown (5YR 4/4) and 50 percent very dark gray (5YR 3/1) loam, 50 percent reddish brown (5YR 4/3) and 50

percent black (7.5YR 2.5/1), moist; 24 percent clay; massive; moderately hard, firm, slightly sticky, moderately plastic; common very fine roots throughout; common very fine dendritic tubular pores; common fine and medium carbonate masses; very slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Ck2—47 to 51 inches (119 to 130 cm); 40 percent light brown (7.5YR 6/4) and 60 percent dark brown (7.5YR 3/3) clay loam, 40 percent brown (7.5YR 4/4) and 60 percent very dark brown (7.5YR 2.5/3), moist; 28 percent clay; massive; very hard, extremely firm, moderately sticky, very plastic; common very fine roots throughout; many very fine and common fine dendritic tubular pores; common fine and medium carbonate masses; strongly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Ck3—51 to 60 inches (130 to 152 cm); 40 percent reddish brown (5YR 4/4) and 60 percent dark reddish brown (5YR 3/2) sandy clay loam, 40 percent reddish brown (5YR 4/3) and 60 percent dark reddish brown (5YR 3/2), moist; 27 percent clay; massive; very hard, extremely firm, moderately sticky, very plastic; common very fine roots throughout; common very fine dendritic tubular pores; common medium carbonate masses; noneffervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; abrupt wavy boundary.

Range in Characteristics

Clay content of the control section (weighted average): 18 to 35 percent

Ap horizons
- Hue: 5YR, 7.5YR, 10YR
- Value: 3 to 5 dry, 3 to 4 moist
- Chroma: 1 to 3 dry, 1 to 3 moist
- Texture: loamy fine sand, fine sandy loam, sandy clay loam, clay loam, sandy clay
- Clay: 12 to 35 percent

C and Ck horizons
- Hue: 5YR, 7.5YR, 10YR, 2.5YR
- Value: 3 to 6 dry, 2.5 to 4 moist
- Chroma: 1 to 6 dry, 1 to 4 moist
- Texture: fine sandy loam, very fine sandy loam, loam, sandy clay loam, clay loam
- Clay: 18 to 40 percent
- Calcium carbonate equivalent: 0 to 4 percent

Mollic epipedon – the zone from 0 to 41 inches (Ap, Ap2, C).

Some pedons do not have a Ck horizon.

39—Pinavetes-Gish-Councelor complex, 1 to 15 percent slopes

Map Unit Setting

Landform(s): dunes, valley floors
Elevation: 5,850 to 6,350 feet (1,783 to 1,936 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush-Grasslands

Map Unit Composition

Pinavetes and similar soils: 35 percent
Gish and similar soils: 30 percent
Councelor and similar soils: 25 percent
Minor Components: 10 percent
- Moclom
- Rock outcrop
- Soils similar to Councelor with finer textures

Soil Properties and Qualities

Pinavetes soils
Taxonomic classification: Mixed, mesic Ustic Torripsamments
Geomorphic position: occurs on stabilized dunes and sand sheets on mesa summits
Parent material: eolian sands derived from sandstone
Slope: 2 to 15 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 25 percent
    woody debris: 1 percent
    bare soil: 74 percent
  surface rock fragments

Drainage class: excessively drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity total inches: 4.2 (low)
Shrink-swell potential: about 1.5 LEP (low)
Runoff class: low
Hydrologic group: A
Present vegetation: blue grama, Mormon tea, prickly Russian thistle, snakeweed, Utah juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 5’ 39.40’’ north, 110° 30’ 0.20’’ west

C1—0 to 1 inch (0 to 3 cm); light yellowish brown (10YR 6/4) sand, dark yellowish brown (10YR 4/4), moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine and fine roots throughout; noneffervescent; moderately alkaline, pH 8.0; clear wavy boundary.

C2—1 to 41 inches (3 to 104 cm); yellowish brown (10YR 5/6) sand, dark yellowish brown (10YR 4/4), moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; common medium, common coarse, common very fine, and common fine roots throughout; common very fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C3—41 to 60 inches (104 to 152 cm); brown (7.5YR 5/4) sand, brown (7.5YR 4/4), moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; very slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

C horizons
- Hue: 7.5YR, 10YR
- Value: 5 to 7 dry, 4 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: sand, fine sand, loamy sand
- Clay: 2 to 6 percent
- Reaction: slightly alkaline or moderately alkaline

Some pedons have a sandy loam or sandy clay loam texture below the particle size control section.

Gish soils
Taxonomic classification: Fine, mixed, superactive, mesic Ustic Haplocambids
Geomorphic position: occurs on valley floors and stream terraces
Parent material: eolian sands derived from sandstone over alluvium derived from sandstone
Slope: 2 to 4 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 50 percent
  - woody debris: 1 percent
  - bare soil: 49 percent
- surface rock fragments

Drainage class: well drained
Ksat solum: 0.06 to 27.07 inches per hour (0.42 to 191.00 micrometers per second)

Available water capacity total inches: 7.5 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: very rare
Runoff class: high
Hydrologic group: C
Present vegetation: blue grama, prickly Russian thistle, snakeweed, Utah juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 5’ 17.30’’ north, 110° 35’ 20.30’’ west

A—0 to 1 inch (0 to 3 cm); light yellowish brown (10YR 6/4) sandy clay, dark yellowish brown (10YR 4/4), moist; 40 percent clay; weak very coarse platy structure; soft, very friable, moderately sticky, moderately plastic; common very fine and fine roots

throughout; common very fine and fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.2; very abrupt wavy boundary.

C1—1 to 9 inches (3 to 23 cm); light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4), moist; 33 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; common medium, common very fine, and common fine roots throughout; common medium, very fine, and fine dendritic tubular pores; slightly effervescent; moderately alkaline, pH 8.2; very abrupt smooth boundary.

C2—9 to 11 inches (23 to 28 cm); yellowish brown (10YR 5/4) loamy sand, dark yellowish brown (10YR 4/4), moist; 4 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw1—11 to 28 inches (28 to 71 cm); yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4), moist; 42 percent clay; moderate fine subangular blocky structure; moderately hard, friable, moderately sticky, very plastic; few medium and common fine roots throughout; few medium and common fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.2; gradual smooth boundary.

Bw2—28 to 39 inches (71 to 99 cm); yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4), moist; 38 percent clay; moderate fine subangular blocky structure; very hard, very firm, moderately sticky, very plastic; few very fine roots throughout; few very fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C—39 to 60 inches (99 to 152 cm); light yellowish brown (10YR 6/4) loamy sand, dark yellowish brown (10YR 4/4), moist; 4 percent clay; single grain; loose, loose, nonsticky, nonplastic; violently effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Clay content of the control section (weighted average): 35 to 45 percent

A horizon
- Hue: 10YR
- Value: 6 dry, 4 moist
- Chroma: 4 dry or moist
- Texture: sandy loam, sandy clay loam, sandy clay
- Clay: 8 to 40 percent
- Reaction: slightly alkaline or moderately alkaline

C horizons
- Hue: 7.5YR, 10YR, 2.5Y
- Value: 4 to6, dry or moist
- Chroma: 4 or 6, dry or moist
- Texture: loamy sand, loamy fine sand, fine sandy loam, sandy loam, sandy clay loam, sandy clay
- Clay: 18 to 45 percent
- Reaction: slightly alkaline or moderately alkaline

Bw horizons
- Hue: 10YR, 2.5Y
- Value: 4 to 6, dry or moist
- Chroma: 4 to 6, dry or moist
- Texture: sandy clay loam, clay loam, silty clay loam, sandy clay, clay
- Clay: 33 to 45 percent
- Reaction: slightly alkaline or moderately alkaline

Cambic horizon – the zone from 11 to 39 inches (Bw horizons).

Councelor soils
Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torriorthents
Geomorphic position: occurs on valley floors and stream terraces
Parent material: eolian sands derived from sandstone over alluvium derived from sandstone
Slope: 1 to 4 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 25 percent
woody debris: 3 percent
bare soil: 72 percent
surface rock fragments

Drainage class: excessively drained
Ksat solum: 0.20 to 19.98 inches per hour (1.40 to 141.00 micrometers per second)

Available water capacity total inches: 5.3 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Runoff class: low
Hydrologic group: B
Present vegetation: blue grama, galleta, rubber rabbitbrush, snakeweed, Utah juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 5’ 20.80’’ north, 110° 35’ 54.50’’ west

A—0 to 2 inches (0 to 5 cm); light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4), moist; 12 percent clay; weak very thick platy structure; soft, very friable, slightly sticky, nonplastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.2; very abrupt smooth boundary.

Bw—2 to 10 inches (5 to 25 cm); strong brown (7.5YR 5/6) loamy sand, brown (7.5YR 4/4), moist; 10 percent clay; weak medium subangular blocky structure; loose, loose, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; very slightly effervescent; moderately alkaline, pH 8.0; gradual wavy boundary.

C1—10 to 18 inches (25 to 46 cm); light yellowish brown (10YR 6/4) loamy sand, dark yellowish brown (10YR 4/4), moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; common medium, very fine, and fine roots throughout; common medium, very fine, and fine dendritic tubular pores; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

2C2—18 to 45 inches (46 to 114 cm); olive yellow (2.5Y 6/6) fine sandy loam, light olive brown (2.5Y 5/ 6), moist; 14 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few medium and

common fine roots throughout; few medium and common fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

2C3—45 to 60 inches (114 to 152 cm); yellowish brown (10YR 5/6) loamy sand, yellowish brown (10YR 5/4), moist; 6 percent clay; single grain; loose, loose, nonsticky, nonplastic; few very fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A horizon
- Hue: 10YR
- Value: 4 to 6 dry, 4 moist
- Chroma: 4 dry or moist
- Texture: loamy sand, sandy loam
- Clay: 8 to 12 percent
- Reaction: slightly alkaline or moderately alkaline

Bw horizon
- Hue: 7.5YR, 10YR
- Value: 4 to 6, dry or moist
- Chroma: 4 to 8, dry or moist
- Texture: loamy sand, sandy loam, fine sandy loam, sandy clay loam
- Clay: 10 to 21 percent

C horizons
- Hue: 7.5YR, 10YR, 2.5Y
- Value: 4 to 6, dry or moist
- Chroma: 4 to 6, dry or moist
- Texture: loamy sand, fine sandy loam, sandy clay loam
- Clay: 4 to 36 percent

40—Plumasano-Lithic Ustipsamments-Royosa complex, 1 to 6 percent slopes

Map Unit Setting

Landform(s): mesas
Elevation: 6,500 to 7,000 feet (1,981 to 2,134 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (7.8 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (8.9 to 11.1 degrees C)
Frost-free period: 120 to 150 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-6AZ Colorado Plateau Pinyon-Juniper Sagebrush

Map Unit Composition

Plumasano and similar soils: 40 percent
Lithic Ustipsamments and similar soils: 25 percent
Royosa and similar soils: 20 percent
Minor Components: 15 percent
- Aridic Ustorthents and similar soils
- Rock outcrop
- Soils similar to Royosa with finer textures in the control section

Soil Properties and Qualities

Plumasano soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Aridic Haplustepts
Geomorphic position: occurs on flats and interdunes on mesa tops
Parent material: eolian sands derived from sandstone over residuum weathered from sandstone
Slope: 1 to 4 percent
Surface cover
Biological crust
cyanobacteria: 8 percent
lichen: 0 percent
moss: 2 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 60 percent
woody debris: 5 percent
bare soil: 25 percent
surface rock fragments

Drainage class: excessively drained
Ksat solum: 0.57 to 19.98 inches per hour (4.00 to 141.00 micrometers per second)

Available water capacity total inches: 7.0 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: B
Present vegetation: blue grama, Ephedra cutleri, pinyon, plains prickly pear, Utah juniper, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 35° 58’ 30.70’’ north, 110° 3’ 47.90’’ west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4), moist; 4 percent clay; weak medium platy structure; soft, friable, slightly sticky, nonplastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.0; very abrupt wavy boundary.

AB—2 to 7 inches (5 to 18 cm); strong brown (7.5YR 5/6) loamy fine sand, strong brown (7.5YR 4/6), moist; 5 percent clay; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common medium, very fine, and fine roots throughout; common very fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bw—7 to 22 inches (18 to 56 cm); strong brown (7.5YR 5/6) fine sandy loam, strong brown (7.5YR 4/6), moist; 11 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common medium, very fine, and fine roots throughout; common fine dendritic tubular pores; strongly effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

Bk—22 to 32 inches (56 to 81 cm); brown (7.5YR 5/4) fine sandy loam, strong brown (7.5YR 5/6), moist; 14 percent clay; moderate coarse subangular blocky parts to moderate medium subangular blocky structure; very hard, very firm, slightly sticky, slightly plastic; common medium, very fine, and fine roots throughout; common very fine dendritic tubular pores; common fine carbonate masses; violently effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

2C1—32 to 52 inches (81 to 132 cm); brownish yellow (10YR 6/6) loamy sand, yellowish brown (10YR 5/6), moist; 4 percent clay; single grain; loose, loose, nonsticky, nonplastic; interstitial pores; 2 percent channer; noneffervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

2C2—52 to 60 inches (132 to 152 cm); brownish yellow (10YR 6/6) loamy sand, yellowish brown (10YR 5/6), moist; 5 percent clay; single grain; loose, loose, nonsticky, nonplastic; interstitial pores; 10 percent channer; very slightly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A and AB horizons
- Hue: 7.5YR, 10YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 4 to 6 dry, 3 to 6 moist
- Texture: loamy fine sand, loamy sand, sandy loam, fine sandy loam
- Clay: 4 to 11 percent
- Reaction: slightly alkaline to moderately alkaline

Bw horizon
- Hue: 7.5YR, 10YR
- Value: 4 to 6 dry, 3 to 4 moist
- Chroma: 4 to 6, dry or moist
- Texture: sandy loam, fine sandy loam, loam
- Clay: 11 to 15 percent
- Reaction: moderately alkaline or strongly alkaline

Bk horizon
- Hue: 7.5YR, 10YR
- Value: 4 to 5 dry, 3 to 5 moist
- Chroma: 4 to 6, dry or moist
- Texture: sandy loam, fine sandy loam, loam
- Clay: 10 to 15 percent
- Rock fragments: 0 to 5 percent

2C horizons
- Hue: 10YR
- Value: 5 or 6 dry, 5 moist
- Chroma: 6 dry or moist
- Texture: fine sand, loamy sand, sandy loam, fine sandy loam, loam
- Clay: 3 to 13 percent
- Rock fragments: 0 to 10 percent

Cambic horizon – the zone from 7 to 32 inches (Bw and Bk horizons).

Lithic Ustipsamments soils
Taxonomic classification: Lithic Ustipsamments
Geomorphic position: occurs on edges of mesas and shallow terraces on mesa tops
Parent material: eolian sands

Slope: 2 to 5 percent
Surface cover
  Biological crust
    cyanobacteria: 8 percent
    lichen: 0 percent
    moss: 2 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 55 percent
    woody debris: 5 percent
    bare soil: 15 percent
  surface rock fragments
    gravel: 13 percent
    flagstone: 2 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 0.5 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: D
Present vegetation: Bigelow sagebrush, broom snakeweed, pinyon, Stansbury cliffrose, Utah juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 35° 57’ 44.90’’ north, 110° 3’ 22.00’’ west

A—0 to 4 inches (0 to 10 cm); light yellowish brown (10YR 6/4) fine sand, dark yellowish brown (10YR 4/4), moist; 2 percent clay; weak medium platy and weak fine subangular blocky structure; common medium, coarse, and fine roots throughout; common medium and fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

C—4 to 10 inches (10 to 25 cm); light yellowish brown (10YR 6/4) fine sand, dark yellowish brown (10YR 4/4), moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; common coarse, and fine roots throughout; common medium and fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.6; abrupt wavy boundary.

2R—10 inches (25 cm); fractured, unweathered sandstone bedrock.

Range in Characteristics

Lithic Ustipsamments have soil properties that vary greater than family class limits.

A horizon
  Hue: 7.5YR, 10YR
  Value: 5 to 6 dry, 4 moist
  Chroma: 4 to 6, dry or moist

Texture: fine sand, loamy sand, loamy fine sand
Clay: 2 to 7 percent

C horizon
Hue: 7.5YR, 10YR
Value: 4 to 6, dry or moist
Chroma: 4 to 6, dry or moist
Texture: fine sand, coarse sand, loamy sand
Clay: 1 to 9 percent
Reaction: moderately to strongly alkaline

Royosa soils
Taxonomic classification: Mixed, mesic Aridic Ustipsamments
Geomorphic position: occurs on eolian sand dunes on mesa tops
Parent material: eolian sands derived from sandstone
Slope: 1 to 6 percent
Surface cover
Biological crust
cyanobacteria: 10 percent
lichen: 5 percent
moss: 5 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 45 percent
woody debris: 5 percent
bare soil: 30 percent
surface rock fragments

Drainage class: excessively drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity total inches: 6.2 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: very low
Hydrologic group: A
Present vegetation: blue grama, pinyon, Utah juniper, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 35° 58’ 38.00’’ north, 110° 3’ 52.20’’ west

C1—0 to 4 inches (0 to 10 cm); brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4), moist; 4 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—4 to 38 inches (10 to 97 cm); strong brown (7.5YR 5/6) fine sand, strong brown (7.5YR 4/6), moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; common coarse, very fine, and fine roots throughout; common very fine and fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.2; gradual smooth boundary.

C3—38 to 48 inches (97 to 122 cm); light yellowish brown (10YR 6/4) fine sand, yellowish brown (10YR 5/4), moist; 2 percent clay; single grain; loose, loose,

nonsticky, nonplastic; few coarse roots throughout; few coarse dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

C4—48 to 60 inches (122 to 152 cm); light brown (7.5YR 6/4) fine sand, brown (7.5YR 5/4), moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; slightly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

C horizons
Hue: 7.5YR, 10YR
Value: 4 to 7 dry, 4 to 6 moist
Chroma: 4 to 6, dry or moist
Texture: sand, fine sand, loamy sand, loamy fine sand
Clay: 2 to 15 percent

41—Reef-Mido-Zukan complex, 2 to 35 percent slopes

Map Unit Setting

Landform(s): mesas
Elevation: 6,230 to 7,010 feet (1,900 to 2,137 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to13.3 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush - Grasslands

Map Unit Composition

Reef and similar soils: 50 percent
Mido and similar soils: 20 percent
Zukan and similar soils: 20 percent
Minor Components: 10 percent
- Tekapo and similar soils
- Pinepoint and similar soils
- Begay and similar soils
- Rock outcrop
- Riverwash
- Reef and similar soils that have finer textures
- Zukan and similar soils that have finer textures

Map unit originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Soil Properties and Qualities

Reef soils
Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Geomorphic position: occurs on structural benches and ledges of mesa escarpments
Parent material: residuum weathered from sandstone and shale
Slope: 2 to 35 percent
Surface cover
Biological crust
cyanobacteria: 10 percent

lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 25 percent
woody debris: 10 percent
bare soil: 25 percent
surface rock fragments
channer: 30 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 1.0 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: D
Present vegetation: pinyon, Stansbury cliffrose, Utah juniper, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 23’ 53.30’’ north, 110° 37’ 5.70’’ west

C1—0 to 3 inches (0 to 8 cm); brown (7.5YR 5/4) channery sandy loam, brown (7.5YR 4/4), moist; 14 percent clay; single grain; soft, very friable, nonsticky, nonplastic; common fine roots throughout; few very fine tubular pores; 30 percent channer; strongly effervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

C2—3 to 11 inches (8 to 28 cm); brown (7.5YR 5/4) very channery sandy loam, brown (7.5YR 4/4), moist; 18 percent clay; massive; soft, friable, nonsticky, nonplastic; few very fine roots around fragments; common very fine vesicular pores; 40 percent channer; violently effervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

C3—11 to 14 inches (28 to 36 cm); brown (7.5YR 5/4) very channery sandy loam, brown (7.5YR 4/4), moist; 18 percent clay; massive; soft, friable, nonsticky, nonplastic; few very fine roots in cracks and few fine roots around fragments; few fine tubular pores; 40 percent channer; violently effervescent; slightly alkaline, pH 7.6; clear smooth boundary.

R—14 inches (36 cm); fractured, unweathered sandstone bedrock.

Range in Characteristics

Clay content of the control section (weighted average): 10 to 18 percent

C horizons
Hue: 7.5YR, 5YR
Value: 5 to 6 dry, 4 to 6 moist
Chroma: 3 to 6, dry or moist

Texture: sandy loam, fine sandy loam,
Clay: 10 to 18 percent
Reaction: neutral to moderately alkaline
Rock fragments: 35 to 50 percent channers

Mido soils
Taxonomic classification: Mixed, mesic Ustic Torripsamments
Geomorphic position: occurs on stabilized dunes and sand sheets on mesa summits
Parent material: eolian sands derived from sandstone
Slope: 2 to 20 percent
Surface cover
Biological crust
cyanobacteria: 10 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 25 percent
woody debris: 10 percent
bare soil: 55 percent
surface rock fragments

Drainage class: excessively drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity total inches: 4.2 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: A
Present vegetation: pinyon, Stansbury cliffrose, Utah juniper, Wyoming big sagebrush, yucca
Land capability (non irrigated): 6c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 25’ 32.40’’ north, 110° 39’ 40.30’’ west

C1—0 to 3 inches (0 to 8 cm); light brown (7.5YR 6/4) fine sand, brown (7.5YR 5/4), moist; 4 percent clay; single grain; loose, loose, nonsticky, nonplastic; many very fine roots throughout; common very fine interstitial pores; slightly effervescent; slightly alkaline, pH 7.6; gradual smooth boundary.

C2—3 to 60 inches (8 to 152 cm); reddish yellow (7.5YR 6/6) fine sand, strong brown (7.5YR 5/6), moist; 4 percent clay; massive; soft, very friable, nonsticky, nonplastic; few coarse roots and many very fine roots throughout; common very fine interstitial pores; strongly effervescent; slightly alkaline, pH 7.8; gradual smooth boundary.

Range in Characteristics

C horizons
Hue: 7.5YR
Value: 5 to 6, dry or moist

Chroma: 4 to 6, dry or moist
Texture: sand, fine sand, loamy fine sand
Clay: 2 to 6 percent
Reaction: neutral to slightly alkaline

Zukan soils

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Geomorphic position: occurs on structural benches and ledges on mesa escarpments
Parent material: alluvium derived from sandstone and/or colluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale
Slope: 2 to 10 percent
Surface cover
Biological crust
cyanobacteria: 10 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 30 percent
woody debris: 10 percent
bare soil: 20 percent
surface rock fragments
channer: 40 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 1.8 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: medium
Hydrologic group: D
Present vegetation: broom snakeweed, pinyon, shadscale saltbush, Utah juniper, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 23’ 5.00’’ north, 110° 35’ 49.90’’ west

A—0 to 2 inches (0 to 5 cm); reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4), moist; 30 percent clay; weak fine granular structure; loose, friable, moderately sticky, moderately plastic; few very fine roots throughout; common very fine interstitial pores; 14 percent channer; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk—2 to 8 inches (5 to 20 cm); pale brown (10YR 6/3) clay loam, brown (10YR 5/3), moist; 31 percent clay; moderate medium subangular blocky structure; slightly hard,

friable, moderately sticky, moderately plastic; few very fine roots throughout; common very fine tubular pores; few fine carbonate masses; 10 percent channer; violently effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

C—8 to 11 inches (20 to 28 cm); light yellowish brown (2.5Y 6/3) channery clay loam, brown (10YR 5/3), moist; 30 percent clay; weak fine platy structure; slightly hard, friable, moderately sticky, moderately plastic; few coarse roots around fragments, few very fine roots around fragments, and few fine roots around fragments; few very fine irregular pores; 34 percent channer; violently effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

R—11 inches (28 cm); fractured, unweathered sandstone bedrock.

Range in Characteristics

Clay content of the control section (weighted average): 18 to 32 percent

A horizon
- Texture: fine sandy loam, sandy loam
- Clay: 15 to 32 percent
- Rock fragments: 10 to 25 percent
- Reaction: moderately alkaline or strongly alkaline

Bk horizon
- Hue: 10YR, 7.5YR, 5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 3 to 4, dry or moist
- Texture: sandy loam, sandy clay loam, loam, clay loam
- Clay: 18 to 32 percent
- Calcium carbonate equivalent: 1 to 4 percent
- Reaction: moderately alkaline to strongly alkaline

C horizon
- Hue: 10YR, 2.5Y
- Value: 5 or 6, dry or moist
- Chroma: 3 to 4, dry or moist
- Texture: sandy loam, sandy clay loam, clay loam
- Clay: 20 to 32 percent
- Reaction: moderately alkaline to strongly alkaline
- Rock fragments: 10 to 35 percent

42—Riverwash-Bebeevar complex, 0 to 3 percent slopes

Map Unit Setting

Landform(s): flood plains
Elevation: 5,510 to 5,610 feet (1,680 to 1,710 meters)
Mean annual precipitation: 6 to 10 inches (152 to254 millimeters)
Mean annual air temperature: 54 to 57 degrees F12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Riverwash: 80 percent
Bebeevar and similar soils: 20 percent

Map unit originates from the Soil Survey of Canyon De Chelly National Monument, Arizona.

Soil Properties and Qualities

Riverwash

Range in Characteristics

Riverwash is unstabilized sandy sediment that is frequently flooded, washed, and reworked.

Bebeevar soils
Taxonomic classification: Sandy, mixed, mesic Oxyaquic Torrifluvents
Geomorphic position: occurs on flood plain steps of canyon floors
Parent material: stream alluvium derived from sandstone
Slope: 0 to 3 percent
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 78 percent
woody debris: 82 percent
bare soil: 10 percent
surface rock fragments

Drainage class: moderately well drained
Ksat solum: 2.00 to 99.92 inches per hour (14.11 to 705.00 micrometers per second)

Available water capacity total inches: 4.3 (low)
Shrink-swell potential: about 1.0 LEP (low)
Flooding hazard: rare
Seasonal water table minimum depth: about 6 to 12 inches
Runoff class: high
Hydrologic group: A
Present vegetation: inland saltgrass, Rio Grande cottonweed, Russian-olive, sedge, Kentucky bluegrass
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 9’ 4.60’’ north, 109° 30’ 59.10’’ west

A—0 to 2 inches (0 to 5 cm); brown (10YR 4/3) fine sandy loam, dark yellowish brown (10YR 3/4), moist; 14 percent clay; moderate coarse granular structure; slightly hard, friable, nonsticky, slightly plastic; common very fine roots throughout; common very fine tubular pores; strongly effervescent; moderately alkaline, pH 8.3; clear smooth boundary.

AC—2 to 6 inches (5 to 15 cm); brown (10YR 5/3) sandy loam, dark yellowish brown (10YR 3/4), moist; 16 percent clay; weak medium subangular blocky structure; moderately hard, friable, slightly sticky, slightly plastic; common very fine roots throughout; many very fine tubular pores; few salt crystals on faces of peds; strongly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

C1—6 to 12 inches (15 to 30 cm); light brown (7.5YR 6/4) and brown (10YR 5/3) sandy loam, brown (7.5YR 4/3) and dark yellowish brown (10YR 3/4), moist; 14 percent clay; massive; slightly hard, friable, nonsticky, slightly plastic; common medium and very fine roots throughout; many very fine tubular pores; 5 percent medium reddish yellow (5YR 6/8), dry, masses of oxidized iron; few salt crystals on faces of peds; strongly effervescent; moderately alkaline, pH 8.3; abrupt smooth boundary.

C2—12 to 18 inches (30 to 46 cm); light brown (7.5YR 6/4) and brown (7.5YR 5/3) loamy sand, dark brown (7.5YR 3/4) and brown (7.5YR 4/3), moist; 7 percent clay; massive; soft, very friable, nonsticky, nonplastic; common coarse and very fine roots throughout; common fine tubular pores; 5 percent medium reddish yellow (5YR 6/8), dry, masses of oxidized iron; slightly effervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

C3—18 to 46 inches (46 to 117 cm); light yellowish brown (10YR 6/4) sand, brown (10YR 4/3), moist; 2 percent clay; single grain; soft, loose, nonsticky, nonplastic; 2 percent medium reddish yellow (5YR 6/8), dry, masses of oxidized iron; slightly effervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

C4—46 to 60 inches (117 to 152 cm); light yellowish brown (10YR 6/4) sand, brown (10YR 4/3), moist; 3 percent clay; single grain; soft, loose, nonsticky, nonplastic; 2 percent medium reddish yellow (5YR 6/8), dry, masses of oxidized iron; slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A and AC Horizon
- Hue: 7.5YR, 10YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 3 to 4, dry or moist
- Texture: fine sandy loam, sandy loam
- Clay: 8 to 18 percent
- Reaction: slightly or moderately alkaline

C Horizons
- Hue: 7.5YR, 10YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: sandy loam, loamy sand, sand
- Clay: 1 to 18 percent
- Reaction: slightly or moderately alkaline

Aquic conditions – the zone from 6 to 12 inches.

43—Rock outcrop-Arches-Shedado complex, 2 to 20 percent slopes

Map Unit Setting

Landform(s): dunes, sand sheets, structural benches
Elevation: 5,800 to 6,600 feet (1,768 to 2,012 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush-Grasslands

Map Unit Composition

Rock outcrop: 45 percent
Arches and similar soils: 25 percent
Shedado and similar soils: 15 percent
Minor Components: 15 percent
- Begay and similar soils
- Mido and similar soils
- Reef and similar soils
- Rizno and similar soils
- Soils that have slopes greater than 20 percent

Soil Properties and Qualities

Rock outcrop

Range in Characteristics

Exposures of flat or rolling bedrock derived from sandstone that occurs as slickrock and structural benches. Slopes range 2 to 30 percent, with inclusions of slopes ranging up to 60 percent on short escarpments. Rock outcrop is typically barren but may have sparse vegetation. Vegetation growth is likely to occur in thin layers of eolian or alluvial material accumulated in cracks, crevices, and depressions. This material is typically less than 3 inches thick and is often stabilized by biological soil crusts.

Arches soils
Taxonomic classification: Mixed, mesic Lithic Torripsamments
Geomorphic position: shallow, gently sloping soils that formed in eolian deposits and residuum derived dominantly from sandstone and shale on structural benches, ridges, and escarpments
Parent material: eolian sands derived from sandstone
Slope: 2 to 20 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 25 percent
    woody debris: 5 percent
    bare soil: 70 percent
  surface rock fragments

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 0.5 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: D

Present vegetation: broom snakeweed, Indian ricegrass, needle and thread, rubber rabbitbrush, twoneedle pinyon, Utah juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 16’ 36.00’’ north, 109° 29’ 39.20’’ west

C1—0 to 2 inches (0 to 5 cm); light brown (7.5YR 6/4) sand, brown (7.5YR 5/4), moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; common medium and fine roots throughout; interstitial pores; strongly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

C2—2 to 10 inches (5 to 25 cm); brown (7.5YR 5/4) coarse sand, brown (7.5YR 4/4), moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; common medium and fine roots throughout; interstitial pores; violently effervescent; strongly alkaline, pH 8.6; clear wavy boundary.

R—10 inches (25 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

C horizon
Hue: 5YR, 7.5YR
Value: 4 to 6 dry, 4 to 5 moist
Chroma: 4 to 6, dry or moist
Texture: coarse sand, sand, fine sand, loamy fine sand
Clay: 2 to 4 percent
Reaction: moderately alkaline to strongly alkaline

Shedado
Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torriorthents
Geomorphic position: deep to very deep, gently sloping soils that formed in eolian deposits and residuum derived dominantly from sandstone and shale on structural benches, ridges, and escarpments
Parent material: eolian sands derived from sandstone
Slope: 2 to 4 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 5 percent
woody debris: 1 percent
bare soil: 94 percent
surface rock fragments

Depth to restrictive feature(s): 20 to 60 inches to bedrock, lithic
Drainage class: somewhat excessively drained
Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 6.1 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: B
Present vegetation: broom snakeweed, Indian ricegrass, needle and thread, rubber rabbitbrush, twoneedle pinyon, Utah juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 7’ 8.00’’ north, 109° 30’ 13.10’’ west

A—0 to 2 inches (0 to 5 cm); reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 5/6), moist; 10 percent clay; massive; soft, friable, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Ck—2 to 11 inches (5 to 28 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 19 percent clay; weak coarse subangular blocky structure; moderately hard, friable, slightly sticky, slightly plastic; common fine roots throughout; common very fine dendritic tubular pores; common coarse carbonate masses; violently effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear wavy boundary.

C1—11 to 30 inches (28 to 76 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 15 percent clay; weak medium subangular blocky and weak fine subangular blocky structure; hard, friable, slightly sticky, nonplastic; common fine roots throughout; common very fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.8.

C2—19 to 55 inches (76 to 140 cm); reddish yellow (5YR 6/8) loamy fine sand, yellowish red (5YR 5/6), moist; 10 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; violently effervescent; strongly alkaline, pH 8.8.

R—55 to 65 inches (140 to 165 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

Clay content of the control section (weighted average): 10 to 18 percent

A horizon
- Hue: 5YR
- Value: 5 to 6, dry or moist
- Chroma: 6 dry or moist
- Texture: fine sandy loam, loamy fine sand
- Clay: 5 to 10 percent
- Calcium carbonate equivalent: 0 to 4 percent

Ck horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6, dry or moist
- Chroma: 4 to 6, dry or moist
- Texture: fine sandy loam
- Clay: 12 to 19 percent
- Calcium carbonate equivalent: 5 to 15 percent (carbonates are geogenic and non-diagnostic)

C horizons
Hue: 5YR, 7.5YR
Value: 4 to 6, dry or moist
Chroma: 6 to 8, dry or moist
Texture: fine sand, loamy fine sand, fine sandy loam, very fine sandy loam
Clay: 4 to 15 percent

Some pedons have Bw horizons that do classify as cambic horizons because of coarse textures.

44—Rock outcrop-Sheppard-Needle complex, 0 to 65 percent slopes

Map Unit Setting

Landform(s): dunes, escarpments, plateaus, sand sheets, structural benches
Elevation: 5,500 to 5,900 feet (1,676 to 1,798 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Rock outcrop: 60 percent
Sheppard and similar soils: 20 percent
Needle and similar soils: 15 percent
Minor Components: 5 percent
- Lithic Torriorthents
- Gotho
- Aneth
- Riverwash

Soil Properties and Qualities

Rock outcrop
Slope: 4 to 65 percent

Range in Characteristics

Rock outcrop miscellaneous areas consist of extremely hard or rigid bedrock exposed to the surface. The lithology is typically Wingate sandstone or a similar rock type. It occurs as nearly level to undulating mesas and plateaus with areas of vertical or near vertical exposures. Typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

Sheppard soils
Taxonomic classification: Mixed, mesic Typic Torripsamments
Geomorphic position: occurs on sand sheets and dunes
Parent material: eolian sands derived from sandstone
Slope: 0 to 8 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent

moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 15 percent
woody debris: 2 percent
bare soil: 83 percent
surface rock fragments

Drainage class: excessively drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity total inches: 5.4 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: A
Present vegetation: broom snakeweed, Ephedra, galleta, Indian ricegrass, rabbitbrush, spike dropseed, yucca
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 20’ 19.30’’ north, 109° 41’ 6.10’’ west

C1—0 to 7 inches (0 to 18 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine roots throughout; common fine irregular pores; violently effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—7 to 15 inches (18 to 38 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 4 percent clay; single grain; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; common fine irregular pores; violently effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C3—15 to 60 inches (38 to 152 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 2 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; common medium and common very fine roots throughout; common fine irregular and common fine dendritic tubular pores; violently effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

C horizons
Hue: 5YR, 7.5YR
Value: 4 or 5, dry or moist
Chroma: 4 to 6, dry or moist
Texture: fine sand, loamy sand, loamy fine sand
Clay: 2 to 4 percent
Reaction: moderately alkaline to strongly alkaline

Needle soils
Taxonomic classification: Mixed, mesic Lithic Torripsamments
Geomorphic position: occurs on sandsheets and dunes on structural benches, ledges and escarpments
Parent material: eolian sands derived from sandstone
Slope: 2 to 5 percent

Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 25 percent
    woody debris: 5 percent
    bare soil: 63 percent
  surface rock fragments
    gravel: 5 percent
    cobble: 2 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 0.6 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: D
Present vegetation: broom snakeweed, galleta, Indian ricegrass, rabbitbrush, yucca
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 15’ 9.40” north, 109° 42’ 46.20” west

C1—0 to 2 inches (0 to 5 cm); yellowish red (5YR 5/6) fine sand, reddish brown (5YR 4/4), moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine roots throughout; common very fine irregular pores; slightly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

C2—2 to 6 inches (5 to 15 cm); yellowish red (5YR 5/6) fine sand, reddish brown (5YR 5/4), moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; few fine irregular pores; slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C3—6 to 8 inches (15 to 20 cm); yellowish red (5YR 5/6) fine sand, reddish brown (5YR 5/4), moist; 4 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; few fine irregular pores; strongly effervescent; slightly alkaline, pH 7.8; clear wavy boundary.

2R—8 inches (20 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

C horizons
  Hue: 5YR, 7.5YR
  Value: 5 to 6 dry, 4 to 5 moist
  Chroma: 4 to 6, dry or moist
  Texture: fine sand, loamy sand, loamy fine sand

Clay: 2 to 6 percent
Reaction: slightly alkaline to moderately alkaline

Some pedons have a Cd and or a Cr horizon directly above an underlying R horizon.

45—Rock outcrop-Shinume complex, 15 to 65 percent slopes

Map Unit Setting

Landform(s): escarpments
Elevation: 5,300 to 6,400 feet (1,615 to 1,951 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Rock outcrop: 50 percent
Shinume and similar soils: 40 percent
Minor Components: 10 percent
- Sheppard
- Marcou
- Needle
- Moenkopie
- Active dunes
- Gullied land

Soil Properties and Qualities

Rock outcrop
Slope: 2 to 65 percent

Range in Characteristics

Exposures of steep bedrock and cliffs with small exposures of flat or rolling bedrock, typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

Shinume soils
Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Torriorthents
Geomorphic position: occurs on structural benches and sideslopes of escarpments and buttes
Parent material: alluvium and/or colluvium and/or eolian sands derived from sandstone over residuum weathered from sandstone
Slope: 15 to 65 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent

Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 5 percent
woody debris: 2 percent
bare soil: 59 percent
surface rock fragments
cobble: 5 percent
stone: 5 percent
boulder: 2 percent
channer: 20 percent
flagstone: 2 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: moderately well drained
Ksat solum: 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 0.2 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: D
Present vegetation: broom snakeweed, galleta, rabbitbrush, shadscale saltbush, spike dropseed, Utah serviceberry, yucca
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 36’ 26.80’’ north, 109° 30’ 52.00’’ west

C—0 to 4 inches (0 to 10 cm); yellowish red (5YR 5/6) extremely channery fine sandy loam, yellowish red (5YR 4/6), moist; 12 percent clay; single grain; loose, loose, slightly sticky, nonplastic; few fine roots throughout; common very fine irregular pores; 60 percent channer; violently effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

2R—4 inches (10 cm); unweathered, fractured sandstone bedrock.

Range in Characteristics

C horizon
Hue: 5YR
Value: 4 or 5, dry or moist
Chroma: 6 dry or moist
Texture: sandy loam, fine sandy loam
Clay: 13 to 18 percent
Reaction: moderately alkaline to strongly alkaline
Rock fragments: 35 to 75 percent

46—Sheppard-Aneth-Marcou complex, 0 to 4 percent slopes

Map Unit Setting

Landform(s): dunes, fan remnants, terraces
Elevation: 5,300 to 5,700 feet (1,615 to 1,737 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Sheppard and similar soils: 45 percent
Aneth and similar soils: 30 percent
Marcou and similar soils: 20 percent
Minor Components: 5 percent
- Active dunes
- Riverwash
- Lithic Torriorthents
- Marcou and similar soils that have finer textures

Soil Properties and Qualities

Sheppard soils
Taxonomic classification: Mixed, mesic Typic Torripsamments
Geomorphic position: occurs on stabilized dunes and sand sheets on dune fields
Parent material: eolian sands derived from sandstone
Slope: 1 to 4 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 15 percent
    woody debris: 1 percent
    bare soil: 84 percent
  surface rock fragments

Drainage class: excessively drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity total inches: 4.2 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: very low
Hydrologic group: A
Present vegetation: broom snakeweed, fourwing saltbush, galleta, greasewood, prickly Russian thistle, prickly pear, rubber rabbitbrush, yucca
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 27’ 5.50’’ north, 109° 38’ 25.00’’ west

C1—0 to 2 inches (0 to 5 cm); yellowish red (5YR 5/8) sand, yellowish red (5YR 4/6), moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; few medium, very fine, and fine roots throughout;irregular pores; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C2—2 to 10 inches (5 to 25 cm); reddish yellow (5YR 6/8) fine sand, yellowish red (5YR 5/6), moist; 3 percent clay; massive; soft, loose, nonsticky, nonplastic; common very fine dendritic tubular pores; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C3—10 to 60 inches (25 to 152 cm); reddish yellow (5YR 6/8) fine sand, yellowish red (5YR 5/6), moist; 2 percent clay; massive; soft, loose, nonsticky, nonplastic; 1 percent gravel; very slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

C horizons
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 4 or 5 moist
- Chroma: 6 to 8, dry or moist
- Texture: coarse sand, sand, fine sand, loamy sand, loamy fine sand, fine sandy loam
- Clay: 2 to 6 percent

Some pedons have a Cn horizon that is strongly alkaline.

Aneth soils
Taxonomic classification: Sandy, mixed, mesic Typic Torriorthents
Geomorphic position: occurs on alluvial terraces
Parent material: alluvium derived from sandstone
Slope: 0 to 2 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 18 percent
  - woody debris: 2 percent
  - bare soil: 80 percent
- surface rock fragments

Drainage class: excessively drained
Ksat solum: 5.95 to 99.92 inches per hour (42.00 to 705.00 micrometers per second)

Available water capacity total inches: 4.9 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: A

Present vegetation: blue grama, China tamarisk, Ephedra, fourwing saltbush, prickly Russian thistle, rubber rabbitbrush
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 27’ 7.60’’ north, 109° 38’ 40.30’’ west

C1—0 to 7 inches (0 to 18 cm); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6), moist; 4 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; common fine irregular pores; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

C2—7 to 26 inches (18 to 66 cm); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6), moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; common coarse roots,very fine, and fine roots throughout; common fine irregular pores; violently effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C3—26 to 41 inches (66 to 104 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6), moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; few medium roots and common very fine and fine roots throughout; common fine irregular pores; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Cn—41 to 60 inches (104 to 152 cm); reddish yellow (5YR 6/8) very gravelly coarse sand, yellowish red (5YR 4/6), moist; 4 percent clay; single grain; loose, loose, nonsticky, nonplastic; few fine roots throughout; common fine irregular pores; 42 percent gravel; violently effervescent; strongly alkaline, pH 8.8.

Range in Characteristics

C and Cn horizons
- Hue: 5YR
- Value: 4 to 6 dry or moist
- Chroma: 6 to 8, dry or moist
- Texture: very gravelly coarse sand, loamy sand, loamy fine sand, loamy very fine sand, sandy loam, fine sandy loam
- Clay: 2 to 10 percent
- Reaction: moderately alkaline to very strongly alkaline
- Sodium adsorption ratio: 0 to 4
- Rock fragments: 0 to 45 percent

Some pedons do not have a Cn horizon.

Marcou soils
Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents
Geomorphic position: occurs on fan remnants and terraces of both slope and channel alluvium
Parent material: slope alluvium derived from sandstone over alluvium derived from sandstone
Slope: 0 to 4 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent

Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 20 percent
woody debris: 5 percent
bare soil: 75 percent
surface rock fragments

Drainage class: somewhat excessively drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity total inches: 7.4 (high)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: A
Present vegetation: broom snakeweed, fourwing saltbush, galleta, greasewood, Indian ricegrass, prickly Russian thistle, rubber rabbitbrush
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 27’ 9.10’’ north, 109° 38’ 51.40’’ west

C1—0 to 10 inches (0 to 25 cm); reddish yellow (5YR 6/8) fine sandy loam, yellowish red (5YR 5/8), moist; 8 percent clay; massive; soft, very friable, slightly sticky, nonplastic; common fine roots throughout; common fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—10 to 23 inches (25 to 58 cm); reddish yellow (5YR 6/8) very fine sandy loam, yellowish red (5YR 5/8), moist; 10 percent clay; massive; very hard, extremely firm, moderately sticky, nonplastic; common fine roots throughout; common fine irregular pores; very slightly effervescent; strongly alkaline, pH 8.5; clear smooth boundary.

C3—23 to 57 inches (58 to 145 cm); yellowish red (5YR 5/8) fine sandy loam, yellowish red (5YR 5/6), moist; 11 percent clay; massive; hard, firm, moderately sticky, slightly plastic; few fine roots throughout; common fine irregular pores; strongly effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

2C—57 to 60 inches (145 to 152 cm); yellowish red (5YR 5/8) loamy sand, yellowish red (5YR 4/6), moist; 6 percent clay; single grain; loose, loose, slightly sticky, nonplastic; few fine roots throughout; common fine irregular pores; slightly effervescent; strongly alkaline, pH 8.5.

Range in Characteristics

C horizons
Hue: 2.5YR, 5YR, 7.5YR
Value: 4 to 6 dry, 4 or 5 moist
Chroma: 4 to 8 dry, 6 or 8 moist
Texture: loamy sand, loamy fine sand, sandy loam, fine sandy loam, very fine sandy loam
Clay: 6 to 18 percent
Reaction: moderately alkaline to very strongly alkaline

47—Sheppard-Needle-Rock outcrop complex, 1 to 12 percent slopes

Map Unit Setting

Landform(s): dune fields
Elevation: 4,250 to 5,900 feet (1,295 to 1,798 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Sheppard and similar soils: 60 percent
Needle and similar soils: 25 percent
Rock outcrop, Wingate Sandstone: 10 percent
Minor Components: 5 percent
- Active dunes and sand sheets
- Gullied land

Map unit originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Soil Properties and Qualities

Sheppard soils
Taxonomic classification: Mixed, mesic Typic Torripsamments
Geomorphic position: occurs on stabilized dunes and sand sheets on dune fields
Parent material: eolian sands derived from sandstone over residuum weathered from sandstone
Slope: 1 to 12 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 15 percent
    woody debris: 5 percent
    bare soil: 80 percent
  surface rock fragments

Drainage class: excessively drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity total inches: 4.3 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: negligible
Hydrologic group: A
Present vegetation: blackbrush, Ephedra cutleri

Land capability (non irrigated): 7c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 49’ 17.70’’ north, 111° 31’ 58.70’’ west

C1—0 to 3 inches (0 to 8 cm); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 5/6), moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; few very fine and fine roots throughout; noneffervescent; moderately alkaline, pH 8.0; clear wavy boundary.

C2—3 to 13 inches (8 to 33 cm); yellowish red (5YR 5/8) fine sand, yellowish red (5YR 4/6), moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots throughout; few very fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.0; clear wavy boundary.

C3—13 to 62 inches (33 to 157 cm); reddish yellow (5YR 6/8) fine sand, yellowish red (5YR 4/6), moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; few medium and fine roots throughout; few very fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.4.

Range in Characteristics

C horizons
- Hue: 5YR, 7.5YR
- Value: 4 to 7 dry, 3 to 6 moist
- Chroma: 4 to 8, dry or moist
- Texture: sand, fine sand
- Clay: 2 to 4 percent
- Reaction: slightly alkaline to moderately alkaline

Needle soils
Taxonomic classification: Mixed, mesic Lithic Torripsamments
Geomorphic position: occurs on sand sheets in dune fields
Parent material: eolian sands derived from sandstone over residuum weathered from sandstone
Slope: 1 to 11 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 26 percent
  - woody debris: 10 percent
  - bare soil: 60 percent
- surface rock fragments
  - gravel: 4 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic

Drainage class: well drained

Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 0.6 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: very low
Hydrologic group: D
Present vegetation: blackbrush, Ephedra cutleri
Land capability (non irrigated): 7c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 49’ 51.40’’ north, 111° 32’ 25.50’’ west

C1—0 to 2 inches (0 to 5 cm); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 4/6), moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; few very fine roots throughout; noneffervescent; moderately alkaline, pH 8.0; clear wavy boundary.

C2—2 to 9 inches (5 to 23 cm); yellowish red (5YR 5/6) sand, reddish brown (5YR 4/4), moist; 3 percent clay; single grain; soft, very friable, nonsticky, nonplastic; few fine, very fine, and fine roots; few very fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.0; clear irregular boundary.

2R—9 inches (23 cm); violently effervescent; fractured, weathered sandstone bedrock.

Range in Characteristics

C horizons
- Hue: 5YR, 7.5YR
- Value: 4 to 7 dry, 3 to 6 moist
- Chroma: 4 to 8, dry or moist
- Texture: sand, coarse sand, fine sand
- Clay: 2 to 4 percent
- Reaction: slightly alkaline to moderately alkaline

Rock outcrop, Wingate Sandstone
Slope: 1 to 12 percent

Range in Characteristics

Exposures of flat or rolling bedrock, typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

48—Sodic Ustic Haplocambids-Begay complex, 1 to 5 percent slopes

Map Unit Setting

Landform(s): stream terraces
Elevation: 6,300 to 6,900 feet (1,920 to 2,103 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)

Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 135to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush-Grasslands

Map Unit Composition

Sodic Ustic Haplocambids and similar soils: 50 percent
Begay and similar soils: 40 percent
Minor Components: 10 percent
- Urban land
- Ustic Haplocambids with a fine-loamy particle size class
- Ustic Torripsamments
- Soil similar to Begay with coarser textures in the control section

Soil Properties and Qualities

Sodic Ustic Haplocambids soils
Taxonomic classification: Sodic Ustic Haplocambids
Geomorphic position: occurs on stream terraces
Parent material: alluvium derived from sandstone
Slope: 1 to 5 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 50 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 10 percent
    woody debris: 0 percent
    bare soil: 40 percent
  surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 60.09 inches per hour (1.40 to 424.00 micrometers per second)

Available water capacity total inches: 9.0 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: C
Present vegetation: greasewood, sage
Land capability (irrigated): 2c

Typical Profile

Location
Geographic Coordinate System: 36° 24’ 52.80’’ north, 109° 13’ 35.70’’ west

An—0 to 6 inches (0 to 15 cm); yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6), moist; 3 percent clay; massive; loose, loose, nonsticky, nonplastic; common medium, coarse, and very fine roots throughout; common very fine dendritic tubular pores; slightly effervescent; very strongly alkaline, pH 9.9; abrupt smooth boundary.

Bn—6 to 12 inches (15 to 30 cm); yellowish red (5YR 5/8) loam, yellowish red (5YR 4/6), moist; 11 percent clay; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common medium, coarse, very fine, and fine roots throughout; common very fine dendritic tubular pores; strongly effervescent; very strongly alkaline, pH 9.9; gradual wavy boundary.

Bkn—12 to 18 inches (30 to 46 cm); yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6), moist; 7 percent clay; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine and very fine roots throughout; common very fine dendritic tubular pores; few medium carbonate masses; strongly effervescent, 10 percent calcium carbonate equivalent; very strongly alkaline, pH 9.7; gradual wavy boundary.

Bkny—18 to 21 inches (46 to 53 cm); yellowish red (5YR 4/6) sandy clay loam, reddish brown (5YR 4/4), moist; 24 percent clay; weak coarse subangular blocky structure; moderately hard, friable, moderately sticky, moderately plastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; common medium carbonate masses; slightly effervescent, 1 percent calcium carbonate equivalent and 5 percent gypsum; neutral, pH 7.1; gradual wavy boundary.

B’kn—21 to 41 inches (53 to 104 cm); yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6), moist; 16 percent clay; weak coarse subangular blocky structure; hard, friable, slightly sticky, nonplastic; common medium, very fine, and fine roots throughout; common very fine and fine dendritic tubular pores; few medium carbonate masses; slightly effervescent, 8 percent calcium carbonate equivalent; very strongly alkaline, pH 9.4; gradual wavy boundary.

Cn—41 to 60 inches (104 to 152 cm); yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6), moist; 16 percent clay; massive; slightly hard, very friable, slightly sticky, nonplastic; common very fine and fine dendritic tubular pores; violently effervescent; very strongly alkaline, pH 9.2.

Range in Characteristics

Sodic Ustic Haplocambids have soil properties that vary greater than family class limits.

An horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 7 dry, 4 to 5 moist
- Chroma: 3 to 6, dry or moist
- Texture: very fine sandy loam, fine sandy loam, loam
- Clay: 3 to 16 percent
- Reaction: moderately alkaline to very strongly alkaline
- Calcium carbonate equivalent: 1 to 14 percent
- Gypsum: 1 to 4 percent
- EC: 0 to 10 mmhos/cm
- Sodium adsorption ratio: 14 to 60

Bn horizon
- Hue: 5YR
- Value: 4 to 6 dry, 4 to 5 moist
- Chroma: 4 to 8, dry or moist
- Texture: loam, fine sandy loam
- Clay: 8 to 18 percent
- Reaction: strongly alkaline to very strongly alkaline
- Calcium carbonate equivalent: 1 to 14 percent
- Gypsum: 1 to 4 percent

EC: 0 to 10 mmhos/cm
Sodium adsorption ratio: 14 to 60

Bkn and Bkny horizons
Hue: 5YR, 7.5YR
Value: 4 to 6 dry, 4 moist
Chroma: 4 to 6, dry or moist
Texture: sandy clay loam, fine sandy loam, very fine sandy loam
Clay: 6 to 27 percent
Reaction: neutral to very strongly alkaline
Calcium carbonate equivalent: 1 to 14 percent (less than 5 percent visible)
Gypsum: 0 to 4 percent
EC: 0 to 10 mmhos/cm
Sodium adsorption ratio: 14 to 60

Cn horizon
Hue: 5YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 3 to 8, dry or moist
Texture: very fine sandy loam, loamy fine sand, stratified fine sandy loam and loam, loamy sand, sandy clay loam
Clay: 6 to 27 percent
Reaction: strongly alkaline to very strongly alkaline
Calcium carbonate equivalent: 1 to 14 percent
Gypsum: 0 to 4 percent
EC: 0 to 10 mmhos/cm
Sodium adsorption ratio: 14 to 60

Cambic horizon – the zone from 6 to 12 inches (Byn horizon).

Begay soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
Geomorphic position: well-drained soils occurring on structural benches and terraces
Parent material: alluvium derived from sandstone and/or eolian sands derived from sandstone
Slope: 1 to 5 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 85 percent
woody debris: 5 percent
bare soil: 10 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.57 to 19.98 inches per hour (4.00 to 141.00 micrometers per second)

Available water capacity total inches: 8.3 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none

Runoff class: very low
Hydrologic group: B
Present vegetation: alfalfa, buckwheat, pigweed, squirreltail, western wheatgrass
Land capability (irrigated): 2c

Typical Profile

Location
Geographic Coordinate System: 36° 24’ 54.50’’ north, 109° 14’ 14.80’’ west

Ap1—0 to 4 inches (0 to 10 cm); pink (7.5YR 7/4) loamy fine sand, light brown (7.5YR 6/4), moist; 6 percent clay; single grain; soft, very friable, nonsticky, nonplastic; many medium, very fine, and fine roots throughout; fine vesicular pores; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Ap2—4 to 13 inches (10 to 33 cm); reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4), moist; 26 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common medium, very fine, and fine roots throughout; many fine dendritic tubular pores; strongly effervescent; slightly alkaline, pH 7.5; abrupt smooth boundary.

Ap3—13 to 17 inches (33 to 43 cm); reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4), moist; 11 percent clay; massive; slightly hard, friable, slightly sticky, nonplastic; common very fine and fine roots throughout; many fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.1; abrupt smooth boundary.

Bw1—17 to 25 inches (43 to 63 cm); reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4), moist; 20 percent clay; weak medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; common very fine and fine roots throughout; many fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bw2—25 to 40 inches (63 to 101 cm); reddish brown (5YR 5/4) fine sandy loam, yellowish red (5YR 4/6), moist; 13 percent clay; weak medium subangular blocky and weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; common very fine and fine roots throughout; many fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bw3—40 to 60 inches (101 to 152 cm); yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6), moist; 22 percent clay; weak medium subangular blocky structure; soft, friable, slightly sticky, nonplastic; common very fine and fine roots throughout; many fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Ap horizons
- Hue: 5YR, 7.5YR
- Value: 4 to 7 dry, 3 to 6 moist
- Chroma: 3 to 8, dry or moist
- Texture: loamy very fine sand, loamy fine sand, very fine sandy loam, fine sandy loam, loam, silt loam, silty clay loam, sandy clay loam, clay loam
- Clay: 4 to 32 percent
- Reaction: moderately alkaline to strongly alkaline

Bw horizons
- Hue: 5YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 3 to 6, dry or moist

Texture: loam, fine sandy loam, very fine sandy loam
Clay: 16 to 33 percent
Reaction: moderately alkaline to strongly alkaline

Cambic horizon – the zone from 17 to 60 inches (Bw horizons).

49—Sojourn-Aridic Ustorthents-Rock outcrop complex, 20 to 65 percent slopes

Map Unit Setting

Landform(s): escarpments, hills
Elevation: 6,300 to 7,700 feet (1,920 to 2,347 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (7.8 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (8.9 to 11.1 degrees C)
Frost-free period: 120 to 150 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-6AZ Colorado Plateau Pinyon- Juniper Sagebrush

Map Unit Composition

Sojourn and similar soils: 50 percent
Aridic Ustorthents and similar soils: 30 percent
Rock outcrop: 10 percent
Minor Components: 10 percent
- Aridic Lithic Ustorthents
- Gullied land
- Riverwash

Soil Properties and Qualities

Sojourn soils
Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthents
Geomorphic position: occurs on sideslopes of hills and escarpments
Parent material: residuum weathered from sandstone and siltstone
Slope: 20 to 65 percent
Surface cover
Biological crust
cyanobacteria: 2 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 35 percent
woody debris: 23 percent
bare soil: 10 percent
surface rock fragments
boulder: 5 percent
channer: 15 percent
flagstone: 5 percent
stone: 5 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, paralithic
Drainage class: moderately well drained
Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)
Ksat restrictive layer: 0.20 to 0.57 inches per hour (1.40 to 4.00 micrometers per second)

Available water capacity total inches: 1.6 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: B
Present vegetation: Gambel oak, mountain mahogany, ponderosa pine, prickly pear, silvery lupine
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 32’ 52.00’’ north, 109° 17’ 38.00’’ west

A—0 to 3 inches (0 to 8 cm); reddish brown (5YR 4/3) and dark reddish brown (5YR 3/2) channery fine sandy loam; 8 percent clay; single grain; loose, loose, slightly sticky, nonplastic; common very fine and fine roots throughout; common very fine and fine tubular pores; 10 percent channer, 5 percent flagstone, and 5 percent stone; very slightly effervescent; slightly alkaline, pH 7.8; clear wavy boundary.

C—3 to 20 inches (8 to 51 cm); reddish brown (5YR 4/4) channery fine sandy loam, dark reddish brown (5YR 3/3), moist; 10 percent clay; massive; soft, very friable, slightly sticky, nonplastic; many medium roots and common coarse, very fine, and fine roots throughout; many medium and common coarse, very fine, and fine tubular pores; 15 percent channer, 5 percent flagstone, 5 percent stone; slightly effervescent; slightly alkaline, pH 7.8; clear wavy boundary.

Cr—20 inches (51 cm); weathered, fractured sandstone bedrock.

Range in Characteristics

Sojourn as used in this survey is a taxadjunct to the series because it has a superactive activity class. Sojourn series is a Loamy, mixed, active, calcareous, mesic, shallow, Aridic Ustorthents.

A horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 2 to 4, dry or moist
- Texture: sandy loam, fine sandy loam, very fine sandy loam, sandy clay loam, clay loam
- Clay: 10 to 30 percent
- Reaction: neutral to moderately alkaline

C horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 2 to 6 dry, 2 to 4 moist
- Texture: sandy loam, fine sandy loam, very fine sandy loam, sandy clay loam, clay loam
- Clay: 10 to 35 percent
- Reaction: slightly alkaline to moderately alkaline

Some pedons have a thin Oe horizon at the surface.

Some pedons have an R horizon below the Cr horizon.

Aridic Ustorthents soils
Taxonomic classification: Aridic Ustorthents
Geomorphic position: occurs on hill slopes and structural benches
Parent material: residuum weathered from sandstone and siltstone and/or slope alluvium derived from sandstone and siltstone and/or eolian sands derived from sandstone
Slope: 20 to 50 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 40 percent
woody debris: 10 percent
bare soil: 30 percent
surface rock fragments
gravel: 20 percent

Drainage class: well drained
Ksat solum: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 9.0 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: high
Hydrologic group: C
Present vegetation: blue grama, mountain mahogany, twoneedle pinyon, Utah juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 8’ 43.50’’ north, 109° 8’ 34.10’’ west

A—0 to 3 inches (0 to 8 cm); reddish brown (5YR 5/3) sandy clay loam, reddish brown (5YR 4/3), moist; 27 percent clay; moderate medium granular and moderate fine granular structure; soft, very friable, moderately sticky, moderately plastic; common very fine roots throughout; common very fine irregular pores; 10 percent gravel; strongly effervescent; slightly alkaline, pH 7.8; clear wavy boundary.

C—3 to 8 inches (8 to 20 cm); reddish brown (5YR 4/3) sandy clay loam, reddish brown (5YR 4/3), moist; 30 percent clay; massive; slightly hard, friable, moderately sticky, moderately plastic; common very fine roots throughout; common very fine dendritic tubular pores; 5 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

Ck—8 to 60 inches (20 to 152 cm); reddish gray (5YR 5/2) sandy clay, dark reddish gray (5YR 4/2), moist; 45 percent clay; strong fine angular blocky structure; very hard, very firm, very sticky, moderately plastic; common very fine roots throughout; common very fine dendritic tubular pores; few fine carbonate masses; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

Range in Characteristics

Aridic Ustorthents have soil properties that vary greater than family class limits.

A horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 2 to 6 dry, 2 to 4 moist
- Texture: loamy sand, fine sandy loam, very fine sandy loam, sandy clay loam
- Clay: 5 to 30 percent

C and Ck horizons
- Hue: 5YR, 7.5YR
- Value: 4 to 6, dry or moist
- Chroma: 2 to 6, dry or moist
- Texture: fine sandy loam, very fine sandy loam, sandy clay loam, clay loam, sandy clay, clay
- Clay: 10 to 50 percent
- Calcium carbonate equivalent: 0 to 10 percent (carbonates are geogenic and non-diagnostic)

Some pedons have a Bw horizon that does not meet the thickness requirements of a cambic diagnostic horizon.

Rock outcrop
Slope: 20 to 65 percent

Range in Characteristics

Exposures of flat, rolling, or steep bedrock, typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial or colluvial material.

50—Tekapo and Lithic Ustic Torriorthents soils, and Rock outcrop, 5 to 65 percent slopes

Map Unit Setting

Landform(s): escarpments, mesas
Elevation: 6,100 to 7,000 feet (1,859 to 2,134 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-1AZ Colorado Plateau Mixed Grass Plains

Map Unit Composition

Tekapo and similar soils.
Lithic Ustic Torriorthents and similar soils.
Rock outcrop
Minor Components:
- Atrac and similar soils
- Aquima and similar soils
- Begay and similar soils
- Soils that have slopes from 0 to 4 percent
- Soils similar to Tekapo with yellower hues

Map unit is an undifferentiated group; therefore, components do not always occur together in the same map delineation or in the same percentage of composition.

Soil Properties and Qualities

Tekapo soils
Taxonomic classification: Clayey, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents
Geomorphic position: occurs on steep slopes of escarpments
Parent material: residuum weathered from sandstone and shale
Slope: 20 to 65 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 1 percent
woody debris: 1 percent
bare soil: 93percent
surface rock fragments
gravel: 5 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, densic
Drainage class: somewhat excessively drained
Ksat solum: 0.00 to 0.57 inches per hour (0.01 to 4.00 micrometers per second)

Available water capacity total inches: 1.2 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: very high
Hydrologic group: D
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 26’ 47.70’’ north, 109° 16’ 22.60’’ west

C1—0 to 4 inches (0 to 10 cm); reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4), moist; 50 percent clay; massive; very hard, very firm, very sticky, very plastic; common fine dendritic tubular pores; violently effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

C2—4 to 8 inches (10 to 20 cm); reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4), moist; 50 percent clay; massive; very hard, firm, very sticky, very plastic; common fine dendritic tubular pores; violently effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Cd1—8 to 16 inches (20 to 41 cm); weak red (10R 5/3) sandy clay loam, weak red (10R 4/3), moist; 34 percent clay; massive; very hard, firm, noncemented, very sticky, moderately plastic; common very fine irregular pores; strongly effervescent; slightly alkaline, pH 7.8; clear wavy boundary.

Cd2—16 to 26 inches (41 to 66 cm); weak red (10R 5/3) sandy clay loam, weak red (10R 4/3), moist; 20 percent clay; massive; extremely hard, very firm, noncemented, moderately sticky, slightly plastic; common medium irregular pores; violently effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

Clay content of the control section (weighted average): 20 to 55 percent

C horizons
- Hue: 10B, 10R, 2.5YRValue: 4 to 6 dry, 3 moist
- Chroma: 1 to 4, dry or moist
- Texture: silty clay, clay
- Clay: 45 to 55 percent

Cd horizons
- Hue: 10B, 10R, 10YR
- Value: 4 to 7 dry, 4 moist
- Chroma: 1 to 4, dry or moist
- Texture: sandy clay loam
- Clay: 20 to 35 percent

Some pedons have a thin Cr horizon.

Lithic Ustic Torriorthents soils
Taxonomic classification: Lithic Ustic Torriorthents
Geomorphic position: occurs on mesa tops and ledges of escarpments
Parent material: colluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale
Slope: 5 to 25 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 25 percent
  - woody debris: 5 percent
  - bare soil: 60percent
- surface rock fragments
  - channer: 10 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: moderately well drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 0.6 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: D
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 20’ 9.50’’ north, 109° 16’ 13.50’’ west

A—0 to 2 inches (0 to 5 cm); reddish brown (5YR 5/4) gravelly fine sandy loam, reddish brown (5YR 4/4), moist; 12 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots throughout; many very fine and fine vesicular pores; 10 percent gravel and 5 percent channer; very slightly effervescent; slightly alkaline, pH 7.8; clear wavy boundary.

Bw—2 to 6 inches (5 to 15 cm); yellowish red (5YR 4/6) channery fine sandy loam, reddish brown (5YR 4/4), moist; 16 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common medium and coarse roots, and many very fine and fine roots throughout; many very fine and fine irregular pores; 5 percent gravel and 15 percent channer; very slightly effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

R—6 inches (15 cm); unweathered, fractured sandstone and shale bedrock.

Range in Characteristics

Lithic Ustic Torriorthents have soil properties that vary greater than family class limits.

Rock fragments of the control section: 10 to 20 percent

A horizon
- Hue: 2.5YR, 5YR
- Value: 4 to 5, dry or moist
- Chroma: 3 to 4, dry or moist
- Texture: fine sandy loam, very fine sandy loam, loam, sandy clay loam, clay loam, clay
- Clay: 12 to 45 percent
- Reaction: slightly alkaline to strongly alkaline

Bw horizon
- Hue: 10R, 2.5 YR, 5YR
- Value: 4 to 7, dry or moist
- Chroma: 3 to 6, dry or moist
- Texture: very fine sandy loam, fine sandy loam, loam, sandy clay loam, clay loam, clay
- Clay: 14 to 45 percent
- Reaction: moderately alkaline to strongly alkaline

Bw horizon is not generally thick enough to classify as a cambic horizon.

Rock outcrop
Slope: 5 to 65 percent

Range in Characteristics

Exposures of steep bedrock and cliffs, typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

51—Trail-Ives-Riverwash complex, 0 to 2 percent slopes

Map Unit Setting

Landform(s): flood plains, flood-plain steps
Elevation: 5,000 to 5,800 feet (1,524 to 1,768 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Trail and similar soils: 45 percent
Ives and similar soils: 30 percent
Riverwash: 15 percent
Minor Components: 10 percent
- Aneth and similar soils
- Gotho and similar soils
- Jedditoand similar soils
- Notaland similar soils
- Sheppard and similar soils
- Soils similar to Trail with finer textures in the control section

Soil Properties and Qualities

Trail soils
Taxonomic classification: Sandy, mixed, mesic Typic Torrifluvents
Geomorphic position: occurs in flood plains and flood-plain steps adjacent to active stream channels and riverwash
Parent material: alluvium derived from sandstone
Slope: 0 to 2 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 40 percent
    woody debris: 20 percent
    bare soil: 40 percent
  surface rock fragments

Drainage class: somewhat excessively drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

Available water capacity total inches: 4.4 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: rare
Runoff class: low
Hydrologic group: A
Present vegetation: broom snakeweed, cottonwood, Gooding willow, Russian olive, tamarisk
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 10’ 24.00’’ north, 109° 33’ 56.00’’ west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) sand, brown (7.5YR 4/4), moist; 2 percent clay; massive; loose, loose, nonsticky, nonplastic; common medium, very fine, and fine roots throughout; common very fine and fine dendritic tubular pores; very slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C—2 to 16 inches (5 to 41 cm); 20 percent brown (7.5YR 4/4) and 80 percent light brown (7.5YR 6/4) stratified sand to fine sandy loam, 20 percent dark brown (7.5YR 3/4) and 80 percent brown (7.5YR 5/4), moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine roots throughout; noneffervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Ab—16 to 20 inches (41 to 51 cm); light brown (7.5YR 6/4) stratified fine sandy loam to sand, brown (7.5YR 4/4), moist; 10 percent clay; massive; soft, very friable, nonsticky, nonplastic; common medium, coarse, and fine roots throughout; common very fine and fine dendritic tubular pores; very slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C'—20 to 60 inches (51 to 152 cm); pink (7.5YR 7/4) stratified sand to coarse sand to gravel, light brown (7.5YR 6/4), moist; 3 percent clay; soft, very friable, nonsticky, nonplastic; common medium roots throughout; common fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Clay content of the control section (weighted average): 2 to 10 percent

A and Ab horizons
- Hue: 7.5YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 to 4, dry or moist
- Texture: coarse sand, sand, fine sand, fine sandy loam, very fine sandy loam
- Clay: 1 to 34 percent
- Reaction: slightly alkaline to strongly alkaline

C and C' horizons
- Hue: 7.5YR
- Value: 4 to 7 dry, 3 to 6 moist
- Chroma: 3 to 4, dry or moist
- Texture: coarse sand, sand, fine sand, loamy sand, loamy fine sand, fine sandy loam, very fine sandy loam,
- Clay: 1 to 34 percent
- Reaction: slightly alkaline to strongly alkaline

Some pedons have a Cn horizon that is strongly alkaline.

Ives soils

Taxonomic classification: Coarse-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, mesic Typic Torrifluvents
Geomorphic position: occurs in flood plains and flood-plain steps adjacent to active stream channels and riverwash
Parent material: alluvium derived from sandstone
Slope: 0 to 2 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent

Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 15 percent
woody debris: 5 percent
bare soil: 80 percent
surface rock fragments

Depth to restrictive feature(s): 20 to 40 inches to strongly contrasting textural stratification
Drainage class: well drained
Ksat solum: 0.00 to 19.98 inches per hour (0.01 to 141.00 micrometers per second)

Available water capacity total inches: 3.2 (low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: rare
Runoff class: high
Hydrologic group: D
Present vegetation: broom snakeweed, cottonwood, greasewood, shadscale, tamarisk
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 10’ 33.60’’ north, 109° 34’ 4.70’’ west

A1—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) clay, dark brown (7.5YR 3/3), moist; 42 percent clay; massive; moderately hard, friable, moderately sticky, very plastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; violently effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

A2—2 to 11 inches (5 to 28 cm); brown (7.5YR 5/4) clay, dark brown (7.5YR 3/3), moist; 45 percent clay; massive; moderately hard, very friable, moderately sticky, very plastic; common medium, coarse, very fine, and fine roots throughout; common very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

Ab1—11 to 21 inches (28 to 53 cm); yellowish red (5YR 5/6) stratified loam to clay, brown (7.5YR 5/4), moist; 15 percent clay; massive; slightly hard, friable, slightly sticky, nonplastic; common medium, very fine, and fine roots throughout; common very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Ab2—21 to 25 inches (53 to 64 cm); light brown (7.5YR 6/4) stratified sandy clay loam to clay, brown (7.5YR 5/4), moist; 25 percent clay; massive; moderately hard, friable, moderately sticky, slightly plastic; common medium, coarse, very fine, and fine roots throughout; common very fine and fine tubular pores; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C1—25 to 30 inches (64 to 76 cm); light brown (7.5YR 6/4) sand, brown (7.5YR 5/4), moist; 2 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; 1 percent gravel; noneffervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

C2—30 to 60 inches (76 to 152 cm); pink (7.5YR 7/4) sand, light brown (7.5YR 6/4), moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine and fine roots throughout; noneffervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Ives as used in this survey is a taxadjunct to the series because it has a Coarse-loamy over sandy or sandy-skeletal particle size class. Ives series is a Coarse-loamy, mixed superactive, calcareous, mesic Typic Torrifluvent.

Clay content of the control section (weighted average): 10 to 18 percent

A horizons
- Hue: 7.5YR, 10YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 to 4, dry or moist
- Texture: very fine sandy loam, loam, silt loam, clay loam, silty clay loam, clay
- Clay: 6 to 45 percent
- Reaction: moderately alkaline to strongly alkaline

Ab horizons
- Hue: 5YR, 7.5YR, 10YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 3 to6, dry or moist
- Texture: fine sand, loamy fine sand, fine sandy loam, loam, silt loam, clay loam, sandy clay loam, clay, loam
- Clay: 2 to 25 percent
- Reaction: moderately alkaline to strongly alkaline

C horizons
- Hue: 7.5YR, 10YR
- Value: 4 to 7 dry, 3 to 6moist
- Chroma: 3 to 4, dry or moist
- Texture: sand, fine sand, fine sandy loam, very fine sandy loam, silt loam
- Clay: 2 to 8 percent
- Reaction: moderately alkaline to strongly alkaline

Strongly contrasting particle size classes – the zone from 21 to 30 inches (Coarse-loamy over sandy or sandy-skeletal)

Riverwash
Slope: 0 to 2 percent

Stream Segment Properties and Qualities

Segment
- Length: approximately 32 miles of Chinle Creek starting from the town of Chinle flowing in a northerly direction toward the town of Rock Point
- Stream width: 50 to 150 feet
- Depth: 1 to 3 feet
- Annual stream flow:
  - Average: 0 to 20 cubic feet per second
  - Maximum: 4,840 cubic feet per second
  - Minimum: 0 cubic feet per second
  - Data from Chinle Creek at Chinle, AZ from 1999 to 2006
- Elevation:
  - Upper: 5,500 feet
  - Lower: 5,000 feet

Hydrology
- Stream flow regimen: stream flow regulated by Tsaile and Wheatfields Lakes and upstream diversions for irrigation, livestock tanks, and domestic use
- Active flood plain width: 250 to 2,200 feet
- Flooding hazard: occasional to rare, brief to very brief

Flooding month: January to April and July to September
Seasonal water table minimum depth: greater than 60 inches
Morphology
Average active channel width: 25 feet
Channel composition:
Bedrock: 0 percent
Cobbles: 5 percent
Gravel: 20 percent
Sand: 50 percent
Silt and clay: 25 percent
Bank type:
Cut: 10 percent
Uncut: 90 percent
Vertical cut: 1 to 10 feet; averages 2 to 5 feet
Soils adjacent to the Chinle Creek channel:
Aneth, Trail, Ives, Sheppard, Gotho, Jeddito, Notal
Depositional bar features: dynamic system of inter-braided bars and channels that have the potential to relocate with each major flood event
Meander pattern: irregular meander
Stability: dynamic system of inter-braided components that aggrades and degrades

Range in Characteristics

Very deep, excessively drained and stratified materials consisting of unstabilized sandy, silty, clayey, and or gravelly sediment that is part of a dynamic inter-braided system of bars and channels. This material is not stable and is subject to shifting and sorting. It is usually dry but can be transformed into a temporary watercourse or a short-lived torrent after large amounts of precipitation or excessive runoff within the watershed. Vegetation is usually not supported because of the constant scouring and shifting of sediments.

52—Tsaile clay, 0 to 5 percent slopes

Map Unit Setting

Landform(s): terraces
Elevation: 7,000 to 7,300 feet (2,134 to 2,225 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (7.8 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (8.9 to 11.1 degrees C)
Frost-free period: 120 to 150 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-6AZ Colorado Plateau Pinyon-Juniper Sagebrush

Map Unit Composition

Tsaile and similar soils: 90 percent
Minor Components: 10 percent
- Haplusterts with a very fine particle size class
- Haplustolls with a fine particle size class
- Riverwash

Soil Properties and Qualities

Tsaile soils
Taxonomic classification: Fine, mixed, superactive, mesic Aridic Haplusterts
Geomorphic position: occurs on gently sloping stream terraces and fan remnants

Parent material: alluvium derived from sandstone and shale
Slope: 0 to 5 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 55 percent
    woody debris: 0 percent
    bare soil: 45 percent
  surface rock fragments

Drainage class: well drained
Ksat solum: 0.00 to 0.06 inches per hour (0.01 to 0.42 micrometers per second)

Available water capacity total inches: 9.0 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: very high
Hydrologic group: D
Present vegetation: rubber rabbitbrush, Utah juniper, Wyoming big sagebrush
Land capability (irrigated): 2c

Typical Profile

Location
Geographic Coordinate System: 36° 12’ 15.00’’ north, 109° 7’ 23.30’’ west

A—0 to 4 inches (0 to 10 cm); reddish brown (2.5YR 4/3) clay, dark reddish brown (2.5YR 3/3), moist; 41 percent clay; strong thick platy structure; very hard, firm, very sticky, very plastic; common medium and fine roots throughout; violently effervescent; moderately alkaline, pH 8.4; very abrupt smooth boundary.

Bss1—4 to 14 inches (10 to 36 cm); reddish brown (2.5YR 4/3) clay, dark reddish brown (2.5YR 3/3), moist; 41 percent clay; moderate very coarse prismatic parts to weak coarse wedge structure; extremely hard, very firm, very sticky, very plastic; common medium and fine roots throughout; distinct slickensides (pedogenic) on all faces of peds; 1 percent gravel; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bss2—14 to 45 inches (36 to 114 cm); reddish brown (2.5YR 4/3) clay, dark reddish brown (2.5YR 3/3), moist; 49 percent clay; moderate very coarse wedge parts to moderate very coarse prismatic structure; extremely hard, very firm, very sticky, very plastic; common medium and fine roots throughout; distinct slickensides (pedogenic) on all faces of peds; 1 percent fine gravel; violently effervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

Bss3—45 to 60 inches (114 to 152 cm); reddish brown (2.5YR 4/3) clay, dark reddish brown (2.5YR 3/3), moist; 50 percent clay; weak very coarse wedge structure; extremely hard, very firm, very sticky, very plastic; few fine roots throughout; distinct slickensides (pedogenic) on all faces of peds; violently effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

Clay content of the control section (weighted average): 35 to 60 percent

A horizon
- Hue: 2.5YR, 5YR, 10YR
- Value: 3 to 5 dry, 3 to 4 moist
- Chroma: 2 to 4, dry or moist
- Texture: clay, clay loam
- Clay: 30 to 57 percent
- Reaction: slightly alkaline to moderately alkaline

Bss horizons
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 3 to 5 dry, 3 moist
- Chroma: 2 to 4, dry or moist
- Texture: clay, sandy clay loam, sandy clay, silty clay
- Clay: 30 to 60 percent
- Reaction: slightly alkaline to moderately alkaline
- Rock fragments: 0 to 5 percent

Soil cracks: many vertical cracks 0.25 to 0.5 inches wide from the surface to 30 inches.

Some pedons have a Bssk horizon.

53—Tsaile-Fikel complex, 2 to 10 percent slopes

Map Unit Setting

Landform(s): structural benches, terraces
Elevation: 7,000 to 7,300 feet (2,134 to 2,225 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (7.8 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (8.9 to 11.1 degrees C)
Frost-free period: 120 to150 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-6AZ Colorado Plateau Pinyon-Juniper Sagebrush

Map Unit Composition

Tsaile and similar soils: 50 percent
Fikel and similar soils: 40 percent
Minor Components: 10 percent
- Aridic Lithic Haplusterts and similar soils
- Techzuni and similar soils
- Gullied land
- Riverwash
- Rock outcrop
- Soils similar to Fikel with coarser or finer textures in the control section

Soil Properties and Qualities

Tsaile soils
Taxonomic classification: Fine, mixed, superactive, mesic Aridic Haplusterts
Geomorphic position: occurs on structural benches and low relief hills
Parent material: residuum weathered from sandstone and shale and/or slope alluvium derived from sandstone and shale
Slope: 3 to 10 percent

Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 50 percent
woody debris: 5 percent
bare soil: 30 percent
surface rock fragments
channer: 15 percent

Drainage class: moderately well drained
Ksat solum: 0.20 to 0.57 inches per hour (1.40 to 4.00 micrometers per second)

Available water capacity total inches: 9.0 (high)
Shrink-swell potential: about 10.5 LEP (very high)
Flooding hazard: none
Runoff class: medium
Hydrologic group: C
Present vegetation: Bigelow sagebrush, western wheatgrass
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 11’ 15.00’’ north, 109° 7’ 5.10’’ west

A—0 to 2 inches (0 to 5 cm); reddish brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4), moist; 43 percent clay; strong very fine granular structure; soft, very friable, very sticky, very plastic; common very fine and fine roots throughout; common very fine vesicular and common very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bss1—2 to 28 inches (5 to 71 cm); reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4), moist; 47 percent clay; strong medium angular blocky, strong coarse angular blocky, and strong very coarse angular blocky structure; extremely hard, very firm, very sticky, very plastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; few distinct reddish brown (2.5YR 4/4), dry, slickensides (pedogenic) on all faces of peds and few distinct reddish brown (2.5YR 4/4), dry, pressure faces on all faces of peds; 5 percent channer; slightly effervescent; moderately alkaline, pH 8.2; gradual smooth boundary.

Bss2—28 to 60 inches (71 to 152 cm); reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4), moist; 55 percent clay; strong very coarse angular blocky and strong coarse angular blocky and strong medium angular blocky structure; extremely hard, very firm, very sticky, very plastic; common very fine roots throughout; common very fine dendritic tubular pores; very few distinct reddish brown (2.5YR 4/4), dry, slickensides (pedogenic) on all faces of peds and few distinct reddish brown (2.5YR 4/4), dry, pressure faces on all faces of peds; 5 percent channer; strongly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

Clay content of the control section (weighted average): 30 to 55 percent

A horizon
Hue: 2.5YR, 5YR, 7.5YR
Value: 4 to 5 dry, 3 to 4 moist
Chroma: 3 to 4 dry, 2 to 4 moist
Texture: loam, silt loam, clay loam, clay
Clay: 18 to 55 percent
Reaction: moderately alkaline to strongly alkaline

Bss horizons
Hue: 2.5YR, 5YR
Value: 4 to 5 dry, 3 to 5 moist
Chroma: 2 to 4 dry, 2 to 6 moist
Texture: clay
Clay: 40 to 55 percent
Reaction: moderately alkaline to strongly alkaline
Rock fragments: 0 to 5 percent

Soil cracks: many vertical cracks 0.25 to 0.75 inches wide from the surface to 45 inches

Some pedons have a Cn horizon that is strongly alkaline.

Fikel soils
Taxonomic classification: Fine, mixed, superactive, mesic Aridic Haplustalfs
Geomorphic position: occurs on terraces and low relief hills
Parent material: slope alluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale
Slope: 2 to 5 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 60 percent
woody debris: 5 percent
bare soil: 35 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 10.1 (very high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: medium
Hydrologic group: C
Present vegetation: blue grama, bottlebrush squirrel tail, western wheatgrass, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 11’ 8.50’’ north, 109° 7’ 26.90’’ west

A—0 to 2 inches (0 to 5 cm); reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4), moist; 18 percent clay; weak thin platy and weak medium subangular blocky structure; soft, very friable, moderately sticky, slightly plastic; common very fine and fine roots throughout; common very fine irregular and common very fine dendritic tubular pores; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

Bt1—2 to 7 inches (5 to 18 cm); reddish brown (5YR 4/4) loam, reddish brown (5YR 4/3), moist; 25 percent clay; moderate fine subangular blocky and moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common medium, very fine, and fine roots throughout; common very fine dendritic tubular pores; few faint reddish brown (5YR 4/3), dry, clay films on all faces of peds; noneffervescent; slightly alkaline, pH 7.6; clear wavy boundary.

Bt2—7 to 19 inches (18 to 48 cm); reddish brown (5YR 4/4) clay loam, reddish brown (5YR 4/3), moist; 33 percent clay; strong fine angular blocky and strong medium angular blocky and strong coarse angular blocky structure; very hard, very firm, moderately sticky, moderately plastic; common medium, very fine, and fine roots throughout; common very fine dendritic tubular pores; few distinct reddish brown (5YR 4/3), dry, clay films on all faces of peds; noneffervescent; slightly alkaline, pH 7.8; clear smooth boundary.

Bt3—19 to 30 inches (48 to 76 cm); reddish brown (5YR 4/4) clay loam, reddish brown (5YR 4/3), moist; 35 percent clay; strong coarse angular blocky and strong medium angular blocky and strong fine angular blocky structure; hard, very firm, very sticky, moderately plastic; common medium, very fine, and fine roots throughout; common very fine and fine dendritic tubular pores; common distinct reddish brown (5YR 4/3), dry, clay films on all faces of peds; noneffervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

2Ckss—30 to 60 inches (76 to 152 cm); reddish brown (2.5YR 4/4) clay, reddish brown (2.5YR 4/4), moist; 45 percent clay; strong coarse angular blocky and strong medium angular blocky structure; extremely hard, extremely firm, very sticky, very plastic; common very fine roots throughout; common very fine dendritic tubular pores; few distinct reddish brown (2.5YR 4/4), dry, pressure faces on all faces of peds and few distinct reddish brown (2.5YR 4/4), dry, slickensides (geogenic) on all faces of peds; common fine carbonate masses; 2 percent gravel; slightly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

Range in Characteristics

A horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 5 dry, 3 to 4 moist
- Chroma: 3 to 4, dry or moist
- Texture: fine sandy loam, loam, silt loam, clay loam, silty clay loam
- Clay: 12 to 32 percent
- Reaction: slightly alkaline to moderately alkaline

Bt horizons
- Hue: 5YR, 7.5YR
- Value: 3 to 5 dry, 3 to 4 moist
- Chroma: 2 to 4, dry or moist
- Texture: loam, sandy clay loam, clay loam, silty clay, clay
- Clay: 35 to 50 percent
- Reaction: slightly alkaline to moderately alkaline

2CKss horizon
- Hue: 2.5YR, 5YR

Value: 3 to 4, dry or moist
Chroma: 2 to 4, dry or moist
Texture: loam, clay loam, clay
Clay: 20 to 50 percent
Calcium carbonate equivalent: 0 to 10 percent (carbonates are geogenic and non-diagnostic)
Rock fragments: 0 to 5 percent

Argillic horizon – zone from 2 to 30 inches (Bt horizons).

Some pedons do not have a 2Ckss horizon.

54—Tsosie-Councelor-Campanile complex, 1 to 6 percent slopes

Map Unit Setting

Landform(s): hillslopes, terraces
Elevation: 6,300 to 6,600 feet (1,920 to 2,012 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.3 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-2AZ Colorado Plateau Shrub-Grasslands

Map Unit Composition

Tsosie and similar soils: 45 percent
Councelor and similar soils: 30 percent
Campanile and similar soils: 15 percent
Minor components: 10 percent
- Lithic Torriorthents
- Mido and similar soils
- Riverwash

Soil Properties and Qualities

Tsosie soils
Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Ustic Torriorthents
Geomorphic position: occurs on valley sides, alluvial flats, and terraces
Parent material: alluvium derived from sandstone and shale
Slope: 2 to 4 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 35 percent
woody debris: 10 percent
bare soil: 55 percent

surface rock fragments

Drainage class: well drained
Ksat solum: 0.00 to 5.95 inches per hour (0.01 to 42.00 micrometers per second)

Available water capacity total inches: 8.1 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Runoff class: medium
Hydrologic group: D
Present vegetation: galleta, greasewood, prickly Russian thistle
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 7’ 7.40’’ north, 110° 6’ 32.90’’ west

C1—0 to 4 inches (0 to 10 cm); light olive brown (2.5Y 5/3) sandy clay loam, olive brown (2.5Y 4/3), moist; 25 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; common very fine and fine roots throughout; many fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—4 to 15 inches (10 to 38 cm); light olive brown (2.5Y 5/3) clay loam, olive brown (2.5Y 4/3), moist; 38 percent clay; massive; soft, very friable, moderately sticky, moderately plastic; common very fine and fine roots throughout; common fine irregular and common fine dendritic tubular pores; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C3—15 to 23 inches (38 to 58 cm); light olive brown (2.5Y 5/4) sandy loam, olive brown (2.5Y 4/3), moist; 15 percent clay; massive; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots throughout; common medium dendritic tubular pores; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C4—23 to 48 inches (58 to 122 cm); light yellowish brown (2.5Y 6/4) fine sandy loam, olive brown (2.5Y 4/4), moist; 18 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine and common fine roots throughout; common fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.3; clear smooth boundary.

C5—48 to 60 inches (122 to 152 cm); light yellowish brown (2.5Y 6/4) fine sandy loam, olive brown (2.5Y 4/4), moist; 14 percent clay; weak fine subangular blocky structure; moderately hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; common fine and fine irregular pores; strongly effervescent; moderately alkaline, pH 8.3; clear smooth boundary.

Range in Characteristics

Clay content of the control section (weighted average): 21 to 30 percent

C horizons
- Hue: 2.5Y
- Value: 4 to 6, dry or moist
- Chroma: 3 to 4, dry or moist
- Texture: sandy loam, fine sandy loam, loam, sandy clay loam, clay loam
- Clay: 14 to 38 percent

Councelor soils
Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torriorthents
Geomorphic position: occurs on valley sides, alluvial flats, and terraces

Parent material: eolian deposits derived from sandstone and shale over alluvium derived from sandstone and shale
Slope: 2 to 3 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 20 percent
woody debris: 5 percent
bare soil: 75 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 0.57 inches per hour (1.40 to 4.00 micrometers per second)

Available water capacity total inches: 8.6 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Runoff class: medium
Hydrologic group: C
Present vegetation: broom snakeweed, fourwing saltbush, greasewood, Indian ricegrass, prickly Russian thistle, prickly pear
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 6’ 49.80’’ north, 110° 5’ 49.80’’ west

C1—0 to 9 inches (0 to 23 cm); light olive brown (2.5Y 5/4) sandy clay loam, olive brown (2.5Y 4/4), moist; 25 percent clay; massive; soft, very friable, moderately sticky, moderately plastic; few medium roots and common very coarse and fine roots throughout; common very fine dendritic tubular pores; very slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C2—9 to 16 inches (23 to 41 cm); light olive brown (2.5Y 5/4) sandy loam, light olive brown (2.5Y 5/4), moist; 19 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; noneffervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C3—16 to 33 inches (41 to 84 cm); olive yellow (2.5Y 6/6) sandy loam, olive brown (2.5Y 4/4), moist; 10 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; common very fine roots throughout; common very fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

C4—33 to 44 inches (84 to 112 cm); olive yellow (2.5Y 6/6) sandy clay loam, olive brown (2.5Y 4/4), moist; 22 percent clay; massive; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots throughout; common very fine dendritic tubular pores; 4 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C5—44 to 60 inches (112 to 152 cm); olive yellow (2.5Y 6/6) sandy clay loam, light olive brown (2.5Y 5/4), moist; 21 percent clay; massive; soft, friable, slightly sticky,

slightly plastic; common very fine roots throughout; common very fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Clay content of the control section (weighted average): 12 to 15 percent

C horizons
- Hue: 2.5Y, 10YR
- Value: 4 or 6, dry or moist
- Chroma: 3 or6, dry or moist
- Texture: loamy sand, sandy loam, sandy clay loam
- Clay: 4 to 25 percent
- Rock fragments: 0 to 5 percent

Campanile soils
Taxonomic classification: Fine, mixed, superactive, mesic Chromic Haplotorrerts
Geomorphic position: occurs on valley sides, alluvial flats, and terraces
Parent material: alluvium derived from sandstone and shale
Slope: 1 to 6 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 35 percent
  - woody debris: 15 percent
  - bare soil: 50 percent
- surface rock fragments

Drainage class: well drained
Ksat solum: 0.00 to 0.57 inches per hour (0.01 to 4.00 micrometers per second)

Available water capacity total inches: 9.0 (high)
Shrink-swell potential: about 10.5 LEP (very high)
Runoff class: very high
Hydrologic group: D
Present vegetation: fourwing saltbush, greasewood, Indian ricegrass, prickly Russian thistle, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 8’ 47.50’’ north, 109° 59’ 29.50’’ west

AC—0 to 12 inches (0 to 30 cm); grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2), moist; 50 percent clay; massive; very hard, very firm, very sticky, very plastic; common medium and many fine roots throughout; common very fine dendritic tubular pores; very slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Ckss1—12 to 21 inches (30 to 53 cm); dark grayish brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2), moist; 55 percent clay; weak medium subangular

blocky structure; slightly hard, very friable, very sticky, very plastic; common medium roots, few very fine roots, and many fine roots throughout; many very fine dendritic tubular pores; very few faint pressure faces on all faces of peds and very few distinct slickensides on all faces of peds; common fine carbonate masses; 5 percent gravel; very slightly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual smooth boundary.

Ckss2—21 to 25 inches (53 to 64 cm); grayish brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 3/2), moist; 52 percent clay; massive; moderately hard, friable, very sticky, very plastic; few medium and common fine roots throughout; many very fine dendritic tubular pores; very few faint pressure faces on all faces of peds and very few distinct slickensides on all faces of peds; few fine carbonate masses; slightly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual smooth boundary.

Ckss3—25 to 36 inches (64 to 91 cm); grayish brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 3/2), moist; 48 percent clay; weak medium subangular blocky structure; hard, firm, very sticky, very plastic; few very fine and fine roots throughout; many very fine dendritic tubular pores; very few faint slickensides on all faces of peds and few distinct pressure faces on all faces of peds; common medium carbonate masses; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Ckss4—36 to 60 inches (91 to 152 cm); grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2), moist; 58 percent clay; weak medium angular blocky structure; very hard, very firm, very sticky, very plastic; few fine roots throughout; very few faint slickensides on all faces of peds and few distinct pressure faces on all faces of peds; few medium carbonate masses and common medium carbonate masses; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

Range in Characteristics

Clay content of the control section (weighted average): 45 to 50 percent

AC horizons
- Hue: 2.5Y, 10YR
- Value: 3 to 5, dry or moist
- Chroma: 2 to 3, dry or moist
- Texture: clay loam, clay
- Clay: 36 to 50 percent
- Calcium carbonate equivalent: 5 to 10 percent

Ckss horizons
- Hue: 2.5Y, 10YR
- Value: 4 to 5 dry, 3 to 5 moist
- Chroma: 2 to 5, dry or moist
- Texture: clay loam, silty clay loam, clay
- Clay: 27 to 58 percent
- Calcium carbonate equivalent: 5 to 10 percent
- Rock fragments: 0 to 5 percent

Cambic horizon – the zone from 12 to 60 inches (Bkss horizons).

Soil cracks: many vertical cracks 1.5 to 2.5 inches wide from the surface to 25 inches.

55—Tsosie-Councelor-Riverwash complex, 0 to 4 percent slopes

Map Unit Setting

Landform(s): alluvial flats, terraces
Elevation: 5,900 to 6,230 feet (1,798 to 1,900 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-1AZ Colorado Plateau Mixed Grass Plains

Map Unit Composition

Tsosie and similar soils: 45 percent
Councelor and similar soils: 40 percent
Riverwash: 10 percent
Minor Components: 5 percent
- Gullied land
- Soils similar to Tsosie with finer textures in the control section
- Soils similar to Councelor with finer textures in the control section

Soil Properties and Qualities

Tsosie soils
Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Ustic Torriorthents
Geomorphic position: occurs on alluvial flats and terraces formed by arroyo cuts
Parent material: alluvium derived from sandstone and siltstone
Slope: 0 to 2 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 26 percent
    woody debris: 5 percent
    bare soil: 69 percent
  surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 11.2 (very high)
Shrink-swell potential: about 4.5 LEP (moderate)
Runoff class: negligible
Hydrologic group: C
Present vegetation: black greasewood, fourwing saltbush, prickly Russian thistle
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 11’ 56.00’’ north, 110° 17’ 23.40’’ west

C1—0 to 4 inches (0 to 10 cm); light yellowish brown (2.5Y 6/3) silt loam, olive brown (2.5Y 4/3), moist; 14 percent clay; weak very thick platy structure; soft, very friable, moderately sticky, very plastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C2—4 to 17 inches (10 to 43 cm); light yellowish brown (2.5Y 6/3) clay loam, olive brown (2.5Y 4/3), moist; 30 percent clay; massive; slightly hard, friable, moderately sticky, very plastic; common medium and very fine roots, and many fine roots throughout; common fine dendritic tubular pores; slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C3—17 to 51 inches (43 to 130 cm); light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3), moist; 29 percent clay; massive; hard, firm, slightly sticky, moderately plastic; common very fine and fine roots throughout; common very fine vesicular pores; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C4—51 to 60 inches (130 to 152 cm); pale brown (10YR 6/3) sandy clay loam, brown (10YR 4/3), moist; 34 percent clay; massive; slightly hard, friable, moderately sticky, very plastic; few fine roots throughout; common fine irregular pores; slightly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

Clay content of the control section (weighted average): 15-35 percent

C horizons
- Hue: 10YR, 2.5Y
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 3 to 4, dry or moist
- Texture: loamy sand, sandy loam, fine sandy loam, silt loam, sandy clay loam, clay loam, silty clay loam,
- Clay: 4 to 42 percent
- Reaction: moderately alkaline to strongly alkaline

Some pedons have an A horizon with weak structure.

Councelor soils
Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torriorthents
Geomorphic position: occurs on alluvial flats and terraces formed by arroyo cuts
Parent material: alluvium derived from sandstone and siltstone
Slope: 0 to 4 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 43 percent

woody debris: 8 percent
bare soil: 49 percent
surface rock fragments

Drainage class: somewhat excessively drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 7.8 (high)
Shrink-swell potential: about 1.5 LEP (low)
Runoff class: negligible
Hydrologic group: C
Present vegetation: black greasewood, broom snakeweed, fourwing saltbush, prickly Russian thistle
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 11’ 50.30’’ north, 110° 17’ 19.50’’ west

C1—0 to 7 inches (0 to 18 cm); brown (10YR 5/3) loam, brown (10YR 4/3), moist; 18 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; common medium and fine roots throughout; common fine dendritic tubular and common fine irregular pores; slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C2—7 to 13 inches (18 to 33 cm); brown (10YR 5/3) stratified fine sandy loam to loamy coarse sand to loamy sand to sand to sandy loam, brown (10YR 4/3), moist; 16 percent clay; massive; very hard, friable, slightly sticky, moderately plastic; common medium and fine roots throughout; common fine irregular pores; slightly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

C3—13 to 28 inches (33 to 71 cm); dark grayish brown (10YR 4/2) loamy sand, pale brown (10YR 6/3), moist; 6 percent clay; single grain; loose, loose, slightly sticky, nonplastic; common medium and fine roots throughout; common fine interstitial pores; very slightly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

C4—28 to 60 inches (71 to 152 cm); pale brown (10YR 6/3) loam, brown (10YR 4/3), moist; 19 percent clay; massive; hard, very firm, moderately sticky, moderately plastic; few fine roots throughout; common fine irregular pores; slightly effervescent; slightly alkaline, pH 7.8.

Range in Characteristics

C horizons
Hue: 10YR, 2.5Y
Value: 4 to 6 dry, 4 to 6 moist
Chroma: 2 to 4 dry, 2 to 3 moist
Texture: sand, loamy coarse sand, loamy sand, loamy fine sand, sandy loam, fine sandy loam, loam, sandy clay loam, clay loam, silty clay loam, sandy clay, clay
Clay: 2 to 18 percent
Reaction: slightly alkaline to moderately alkaline

Some pedons have an A horizon with weak structure.
Some pedons do not have stratified C horizons.

Riverwash
Slope: 0 to 4 percent

Range in Characteristics

Riverwash is unstabilized sandy, silty, clayey, or gravelly sediment that is flooded, washed, and reworked frequently by rivers.

56—Tuntsa, moderately deep-Akhoni family-Cumulic Endoaquolls complex, 0 to 25 percent slopes

Map Unit Setting

Landform(s): depressions, structural benches
Elevation: 8,300 to 9,200 feet (2,530 to 2,804 meters)
Mean annual precipitation: 22 to 26 inches (559 to 660 millimeters)
Mean annual air temperature: 39 to 45 degrees F (3.9 to 7.2 degrees C)
Mean annual soil temperature: 41 to 47 degrees F (5.0 to 8.3 degrees C)
Frost-free period: 100 to 120 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-8AZ Colorado Plateau Ponderosa Pine Forests

Map Unit Composition

Tuntsa, moderately deep and similar soils: 45 percent
Akhoni family and similar soils: 30 percent
Cumulic Endoaquolls and similar soils: 10 percent
Minor Components: 15 percent
- Typic Ustorthents
- Rock outcrop
- Soils similar to Tuntsa with coarser textures
- Water

Soil Properties and Qualities

Tuntsa, moderately deep soils
Taxonomic classification: Coarse-loamy, mixed, superactive, frigid Pachic Haplustolls
Geomorphic position: occurs on structural benches on mountain tops
Parent material: alluvium derived from sandstone and/or residuum weathered from sandstone
Slope: 0 to 15 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 35 percent
    woody debris: 10 percent
    bare soil: 55 percent
  surface rock fragments

Depth to restrictive feature(s): 20 to 40 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 3.6 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: C
Present vegetation: Crested wheatgrass, currant, Gambel oak, muttongrass, ponderosa pine, quaking aspen, western brackenfern, western wheatgrass
Land capability (non irrigated): 5c

Typical Profile

Location
Geographic Coordinate System: 36° 29’ 2.10’’ north, 109° 10’ 27.60’’ west

A—0 to 1 inch (0 to 3 cm); dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2), moist; 8 percent clay; weak thin platy parts to weak fine granular structure; soft, very friable, nonsticky, nonplastic; many medium and very fine roots, and common fine roots throughout; many very fine and many fine irregular pores; noneffervescent; neutral, pH 6.8; clear smooth boundary.

AB—1 to 16 inches (3 to 38 cm); dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2), moist; 10 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common medium and fine roots throughout; many very fine dendritic tubular pores; noneffervescent; slightly acid, pH 6.4; clear smooth boundary.

Bw—16 to 30 inches (38 to 76 cm); yellowish brown (10YR 5/6) fine sandy loam, dark yellowish brown (10YR 4/6), moist; 8 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common medium roots, very fine, and fine roots throughout; many very fine dendritic tubular pores; noneffervescent; slightly acid, pH 6.4; abrupt smooth boundary.

R—30 inches (76 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

Clay content of the control section (weighted average): 10 to 18 percent

A and AB horizons
- Hue: 7.5YR, 10YR
- Value: 4 to 5 dry, 2 to3 moist
- Chroma: 1 to 2, dry or moist
- Texture: loamy sand, sandy loam, fine sandy loam, loam
- Clay: 2 to 15 percent
- Reaction: slightly acid to slightly alkaline

Bw horizon
- Hue: 5YR, 7.5YR, 10YR
- Value: 3 to 7 dry, 3 to 5 moist
- Chroma: 2 to 6, dry or moist
- Texture: sand, loamy sand, loamy fine sand, fine sandy loam, sandy loam, loam,
- Clay: 8 to 32 percent
- Reaction: slightly acid to slightly alkaline

Mollic epipedon – the zone from 0 to 16 inches (A and AB horizons).

Cambic horizon – the zone from 16 to 30 inches (Bw horizon).

Some pedons have a Bw horizon that does not meet the requirements of a cambic diagnostic horizon because of coarse textures.

Akhoni family soils
Taxonomic classification: Loamy, mixed, superactive, frigid Lithic Haplustolls
Geomorphic position: occurs on structural benches on mountain tops
Parent material: alluvium derived from sandstone and/or residuum weathered from sandstone
Slope: 2 to 25 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 50 percent
woody debris: 20 percent
bare soil: 30 percent
surface rock fragments

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic
Drainage class: somewhat poorly drained
Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 2.4 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: D
Present vegetation: Crested wheatgrass, currant, Gambel oak, muttongrass, ponderosa pine, quaking aspen, western brackenfern, western wheatgrass
Land capability (non irrigated): 5c

Typical Profile

Location
Geographic Coordinate System: 36° 28’ 49.00’’ north, 109° 11’ 6.00’’ west

A—0 to 1 inch (0 to 3 cm); brown (10YR 4/3) fine sandy loam, very dark grayish brown (10YR 3/2), moist; 8 percent clay; weak very thin platy parts to weak fine granular structure; soft, very friable, nonsticky, nonplastic; common medium roots, many very fine and fine roots throughout; many very fine and fine dendritic tubular pores; noneffervescent; neutral, pH 6.8; clear smooth boundary.

AB—1 to 9 inches (3 to 23 cm); dark brown (10YR 3/3) loam, very dark brown (10YR 2/2), moist; 14 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common medium roots, many very fine roots, and common fine roots throughout; many very fine and common fine dendritic tubular pores; noneffervescent; neutral, pH 6.6; clear smooth boundary.

Bw—9 to 16 inches (23 to 41 cm); brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2), moist; 24 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; hard, friable, moderately sticky, moderately

plastic; common medium roots throughout; common medium and few fine dendritic tubular pores; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

R—16 inches (41 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

Akhoni family differs from the series because this soil has more than 18 percent clay in the particle size control section.

A and AB horizons
- Hue: 7.5YR, 10YR
- Value: 3 to 5 dry, 2 to3 moist
- Chroma: 2 to 3 dry, 1 to 3 moist
- Texture: loamy sand, sandy loam, fine sandy loam, loam
- Clay: 5 to 25 percent
- Reaction: slightly acid to slightly alkaline

Bw horizon
- Hue: 5YR, 7.5YR, 10YR
- Value: 2 to 5 dry, 2 to 4 moist
- Chroma: 2 to 3 dry or moist
- Texture: loamy sand, sandy loam, fine sandy loam, loam
- Clay: 5 to 25 percent
- Reaction: slightly acid to slightly alkaline

Mollic epipedon – the zone from 0 to 16 inches (A, AB, and Bw horizons).

Cambic horizon – the zone from 9 to 16 inches (Bw horizon).

Some pedons do not have a Bw horizon.
Some pedons have a Bw horizon that does not meet the requirements of a cambic diagnostic horizon because of coarse textures (loamy sands).

Cumulic Endoaquolls soils
Taxonomic classification: Cumulic Endoaquolls
Geomorphic position: occurs in depressions on mountain tops
Parent material: alluvium derived from sandstone
Slope: 2 to 10 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 90 percent
  - woody debris: 0 percent
  - bare soil: 10 percent
- surface rock fragments

Drainage class: somewhat poorly drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 9.0 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Seasonal water table minimum depth: about 20 to 60 inches

Runoff class: low
Hydrologic group: C/D
Present vegetation: Crested wheatgrass, Gambel oak, muttongrass, ponderosa pine, western wheatgrass
Land capability (non irrigated): 5c

Typical Profile

Location
Geographic Coordinate System: 36° 22’ 31.80’’ north, 109° 9’ 24.70’’ west

A1—0 to 1 inch (0 to 3 cm); very dark gray (10YR 3/1) loamy fine sand, black (10YR 2/1), moist; 7 percent clay; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine roots throughout; common very fine irregular pores; noneffervescent; slightly acid, pH 6.2; abrupt smooth boundary.

A2—1 to 12 inches (3 to 30 cm); black (10YR 2/1) silty clay, black (10YR 2/1), moist; 42 percent clay; strong fine angular blocky and strong medium angular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine and fine roots throughout; common very fine tubular pores; noneffervescent; slightly acid, pH 6.2; clear smooth boundary.

A3—12 to 20 inches (30 to 51 cm); very dark gray (10YR 3/1) loam, black (10YR 2/1), moist; 10 percent clay; moderate fine subangular blocky and moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots throughout; common very fine irregular pores; 1 percent fine faint strong brown (7.5YR 5/6), dry, iron-manganese concretions with diffuse boundaries in matrix; noneffervescent; slightly acid, pH 6.4; abrupt smooth boundary.

Cg—20 to 32 inches (51 to 81 cm); light brown (7.5YR 6/4) clay, pinkish gray (7.5YR 6/2), moist; 45 percent clay; strong fine and medium angular blocky structure; very hard, very firm, very sticky, moderately plastic; common very fine roots throughout; common very fine irregular pores; 5 percent fine distinct pinkish gray (7.5YR 7/2), dry, iron depletions with diffuse boundaries in matrix and 15 percent fine distinct reddish yellow (7.5YR 6/6), dry, iron-manganese concretions with clear boundaries in matrix; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

C1—32 to 44 inches (81 to 112 cm); reddish yellow (7.5YR 6/6) sandy clay loam, light brown (7.5YR 6/4), moist; 32 percent clay; moderate fine and medium angular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots throughout; common very fine irregular pores; 5 percent fine prominent strong brown (7.5YR 5/6), dry, iron-manganese concretions with clear boundaries in matrix and 10 percent fine distinct pinkish gray (7.5YR 7/2), dry, iron depletions with clear boundaries in matrix and 15 percent fine distinct reddish yellow (7.5YR 6/6), dry, iron-manganese concretions with clear boundaries in matrix; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

C2—44 to 60 inches (112 to 152 cm); pink (7.5YR 7/3) fine sandy loam, light brown (7.5YR 6/4), moist; 8 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine irregular pores; 2 percent fine distinct reddish yellow (7.5YR 6/6), dry, iron-manganese concretions with clear boundaries in matrix and 20 percent fine distinct pinkish gray (7.5YR 7/2), dry, iron depletions with clear boundaries in matrix; noneffervescent; moderately acid, pH 6.0.

Range in Characteristics

Cumulic Endoaquolls have properties that vary greater than family class limits.

A horizons
Hue: 10YR

Value: 2 to 3, dry or moist
Chroma: 1 dry or moist
Texture: loamy fine sand, fine sandy loam, loam, silty clay
Clay: 5 to 45 percent
Reaction: moderately acid to neutral

Cg horizon
Hue: 7.5YR, 10YR
Value: 6 to 7 dry, 2 to 7 moist
Chroma: 2 to 6 dry, 1 to 4 moist
Texture: loam, silty clay, clay
Clay: 25 to 45 percent
Reaction: moderately acid to neutral

C horizons
Hue: 7.5YR, 10YR
Value: 6 to 7 dry, 2 to 7 moist
Chroma: 2 to 6 dry, 1 to 4 moist
Texture: fine sandy loam, loam, sandy clay loam, silty clay, clay
Clay: 8 to 45 percent
Reaction: moderately acid to neutral

Mollic epipedon – the zone from 0 to 20 inches (A horizons).

Aquic soil conditions – the zone from 12 to 60 inches (A, Cg, and C horizons).

Some pedons do not have a Cg horizon.
Some pedons have a thin Oe horizon.

57—Typic Haplustolls, moderately deep-Akhoni-Rock outcrop complex, basalt domes, 5 to 45 percent slopes

Map Unit Setting

Landform(s): escarpments, ridges, structural benches
Elevation: 8,960 to 9,500 feet (2,731 to 2,895 meters)
Mean annual precipitation: 22 to 26 inches (559 to 660 millimeters)
Mean annual air temperature: 39 to 45 degrees F (3.9 to 7.2 degrees C)
Mean annual soil temperature: 41 to 47 degrees F (5.0 to 8.3 degrees C)
Frost-free period: 100 to 120 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-9AZ Colorado Plateau Coniferous Forests

Map Unit Composition

Typic Haplustolls, moderately deep and similar soils: 40 percent
Akhoni and similar soils: 30 percent
Rock outcrop: 20 percent
Minor Components: 10 percent
- Cumulic Endoaquolls
- Typic Ustorthents
- Riverwash

Soil Properties and Qualities

Typic Haplustolls, moderately deep soils
Taxonomic classification: Typic Haplustolls

Geomorphic position: occurs on eroded exposures of basalt domes and structural benches
Parent material: residuum weathered from basalt
Slope: 5 to 15 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 5 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 80 percent
woody debris: 5 percent
bare soil: 10 percent
surface rock fragments

Depth to restrictive feature(s): 20 to 40 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.00 to 0.01 inches per hour (0.00 to 0.07 micrometers per second)

Available water capacity total inches: 5.0 (low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: C
Present vegetation: Gambel oak, muttongrass, ponderosa pine
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 22’ 12.90’’ north, 109° 8’ 52.20’’ west

A1—0 to 3 inches (0 to 8 cm); very dark gray (10YR 3/1) loam, black (10YR 2/1), moist; 14 percent clay; moderate thick platy structure; soft, very friable, slightly sticky, slightly plastic; common medium roots, many very fine and fine roots throughout; many very fine and fine dendritic tubular pores; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

A2—3 to 17 inches (8 to 43 cm); very dark gray (10YR 3/1) loam, black (10YR 2/1), moist; 16 percent clay; moderate thin platy structure; soft, very friable, slightly sticky, slightly plastic; few medium roots, many very fine and fine roots throughout; common very fine and fine dendritic tubular pores; noneffervescent; neutral, pH 7.2; abrupt smooth boundary.

BC—17 to 38 inches (43 to 96 cm); light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4), moist; 17 percent clay; strong thick platy structure; moderately hard, firm, slightly sticky, slightly plastic; few very fine roots throughout; few medium and common very fine and fine dendritic tubular pores; 5 percent gravel; very slightly effervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

2R—38 inches (96 cm); unweathered, unfractured basalt bedrock.

Range in Characteristics

Typic Haplustolls, moderately deep have properties that vary greater than family class limits.

Clay content of the control section (weighted average): 10 to 18 percent

A horizon
- Hue: 10YR
- Value: 2 to 4 dry, 2 to 3 moist
- Chroma: 1 to 3, dry or moist
- Texture: loam, very fine sandy loam
- Clay: 10 to 20 percent

BC horizon
- Hue: 10YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 2 to 4, dry or moist
- Texture: sandy loam, loam, sandy clay loam
- Clay: 12 to 22 percent
- Rock fragments: 0 to 5 percent gravels

Mollic epipedon – the zone from 0 to 17 inches (A horizons).

Some pedons do not have a BC horizon.
Some pedons have a Bw horizon.

Akhoni soils
Taxonomic classification: Loamy, mixed, superactive, frigid Lithic Haplustolls
Geomorphic position: occurs on eroded exposures of basalt domes, ridges, and escarpments
Parent material: residuum weathered from basalt
Slope: 8 to 45 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 5 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 70 percent
  - woody debris: 15 percent
  - bare soil: 10 percent
- surface rock fragments

Depth to restrictive feature(s): 10 to 20 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.00 to 0.01 inches per hour (0.00 to 0.07 micrometers per second)

Available water capacity total inches: 2.8 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: D

Present vegetation: Gambel oak, muttongrass, ponderosa pine
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 22’ 15.70’’ north, 109° 9’ 3.30’’ west

A1—0 to 1 inch (0 to 3 cm); dark gray (10YR 4/1) loam, very dark grayish brown (10YR 3/2), moist; 10 percent clay; moderate thick platy structure; soft, very friable, slightly sticky, nonplastic; common medium, very fine, and fine roots throughout; common very fine irregular and common fine dendritic tubular pores; noneffervescent; neutral, pH 7.0; clear smooth boundary.

A2—1 to 7 inches (3 to 18 cm); brown (7.5YR 4/2) sandy loam, dark brown (7.5YR 3/2), moist; 10 percent clay; weak medium subangular blocky and moderate medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common medium, very fine, and fine roots throughout; common very fine and fine dendritic tubular pores; 5 percent gravel; noneffervescent; neutral, pH 7.0; clear smooth boundary.

BC—7 to 18 inches (18 to 46 cm); brown (7.5YR 5/3) sandy loam, brown (7.5YR 4/3), moist; 18 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common medium, very fine, and fine roots throughout; common very fine irregular pores; 5 percent gravel and 5 percent cobble; noneffervescent; neutral, pH 7.2; abrupt smooth boundary.

R—18 inches (46 cm); unweathered, unfractured basalt bedrock.

Range in Characteristics

A horizons
- Hue: 10YR, 7.5YR
- Value: 2 to 4 dry, 2 to 3 moist
- Chroma: 1 to 3, dry or moist
- Texture: sandy loam, loam, very fine sandy loam
- Clay: 10 to 20 percent

BC horizon
- Hue: 7.5YR
- Value: 5 to 6 dry, 4 to 5 moist
- Chroma: 2 to 4, dry or moist
- Texture: sandy loam, loam, sandy clay loam
- Clay: 12 to 22 percent
- Rock fragments: 0 to 5 percent gravels

Mollic epipedon – the zone from 0 to 7 inches (A horizons).

Some pedons do not have a BC horizon.
Some pedons have a Bw horizon.

Rock outcrop
Slope: 30 to 60 percent

Range in Characteristics

Exposures of steep basalt bedrock and cliffs, typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of alluvial or colluvial material.

58—Typic Haplustolls, moderately deep-Rock outcrop-Typic Ustipsamments complex, 15 to 70 percent slopes

Map Unit Setting

Landform(s): mountain slopes, mountains
Elevation: 7,700 to 8,500 feet (2,350 to 2,591 meters)
Mean annual precipitation: 18 to 22 inches (457 to 559 millimeters)
Mean annual air temperature: 45 to 48 degrees F (7.2 to 8.9 degrees C)
Mean annual soil temperature: 47 to 50 degrees F (8.3 to 10.0 degrees C)
Frost-free period: 110 to 130 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-8AZ Colorado Plateau Ponderosa Pine Forests

Map Unit Composition

Typic Haplustolls, moderately deep and similar soils: 45 percent
Rock outcrop: 30 percent
Typic Ustipsamments and similar soils: 15 percent
Minor Components: 10 percent
- Akhoni and similar soils
- Gullied land
- Riverwash

Soil Properties and Qualities

Typic Haplustolls, moderately deep soils
Taxonomic classification: Typic Haplustolls
Geomorphic position: occurs on mountain slopes
Parent material: residuum weathered from sandstone and/or slope alluvium derived from sandstone
Slope: 15 to 70 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 30 percent
    woody debris: 20 percent
    bare soil: 50 percent
  surface rock fragments

Depth to restrictive feature(s): 20 to 40 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 5.3 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none

Runoff class: medium
Hydrologic group: B
Present vegetation: brackenfern, Douglas fir, Gambel's oak, muttongrass, narrowleaf yucca, pinyon pine, ponderosa pine, quaking aspen, Rocky Mountain juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 27' 40.30'' north, 109° 9' 34.30'' west

Oi—0 to 1 inch (0 to 3 cm); yellowish brown (10YR 5/6) slightly decomposed plant material, yellowish brown (10YR 5/4), moist; 8 percent clay; slightly hard, friable, nonsticky, nonplastic; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

A—1 to 5 inches (3 to 13 cm); very dark grayish brown (10YR 3/2) fine sandy loam, very dark gray (10YR 3/1), moist; 8 percent clay; moderate thick platy and moderate medium platy structure; slightly hard, very friable, nonsticky, nonplastic; common very fine roots throughout; common very fine irregular and tubular pores, and common fine irregular and tubular pores; noneffervescent; slightly acid, pH 6.2; abrupt smooth boundary.

Bw1—5 to 18 inches (13 to 46 cm); very dark grayish brown (10YR 3/2) very fine sandy loam, very dark gray (10YR 3/1), moist; 10 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine roots throughout; common very fine tubular pores; noneffervescent; slightly acid, pH 6.4; clear smooth boundary.

Bw2—18 to 30 inches (46 to 76 cm); brown (10YR 4/3) very fine sandy loam, very dark grayish brown (10YR 3/2), moist; 8 percent clay; weak very fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine roots throughout; common very fine tubular pores; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

BC—30 to 38 inches (76 to 97 cm); yellowish red (5YR 4/6) fine sandy loam, yellowish red (5YR 4/6), moist; 13 percent clay; moderate very fine and fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine roots throughout; common very fine tubular pores; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

R—38 inches (97 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

Typic Haplustolls have soil properties that vary greater than family class limits.

O horizons
- Hue: 10YR
- Value: 5 dry or moist
- Chroma: 8 percent

A horizons
- Hue: 7.5YR, 10YR
- Value: 3 to 5, dry or moist
- Chroma: 3 to 6 dry, 1 to 2 moist
- Texture: loamy fine sandy, sandy loam, fine sandy loam, loam
- Clay: 5 to 23 percent
- Reaction: slightly acid to slightly alkaline

Bw and BC horizons
- Hue: 5YR, 7.5YR, 10YR

Value: 3 to 7 dry, 3 to 5 moist
Chroma: 1 to 6, dry or moist
Texture: loamy fine sand, sandy loam, fine sandy loam, very fine sandy loam, loam, sandy clay loam, clay loam, clay
Clay: 7 to 42 percent
Reaction: slightly acid to neutral

Mollic epipedon – the zone from 1 to 18 inches (A and Bw horizons).

Cambic horizon – the zone from 5 to 30 inches (Bw horizons).

Some pedons have a Bw horizon that does not meet the requirements of a cambic diagnostic horizon because of coarse textures.

Rock outcrop
Slope: 5 to 70 percent

Range in Characteristics

Exposures of steep, or flat and rolling bedrock and cliffs, typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

Typic Ustipsamments soils
Taxonomic classification: Typic Ustipsamments
Geomorphic position: occurs on mountain slopes
Parent material: residuum weathered from sandstone and/or slope alluvium derived from sandstone
Slope: 15 to 45 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 30 percent
woody debris: 20 percent
bare soil: 50 percent
surface rock fragments

Drainage class: somewhat excessively drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

Available water capacity total inches: 5.2 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: high
Hydrologic group: A
Present vegetation: brackenfern, Douglas fir, Gambel's oak, muttongrass, narrowleaf yucca, pinyon pine, ponderosa pine, quaking aspen, Rocky Mountain juniper
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 20' 28.10'' north, 109° 10' 40.10'' west

A—0 to 6 inches (0 to 15 cm); brown (7.5YR 4/3) loamy fine sand, dark brown (7.5YR 3/2), moist; 7 percent clay; weak coarse subangular blocky and weak thin platy structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine irregular and tubular pores, and common fine irregular and tubular pores; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

C1—6 to 31 inches (15 to 79 cm); brown (7.5YR 5/4) fine sand, brown (7.5YR 4/4), moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; common medium and common fine roots throughout; common very fine irregular and tubular pores, and common fine irregular and tubular pores; noneffervescent; neutral, pH 6.6; clear smooth boundary.

C2—31 to 60 inches (79 to 152 cm); light brown (7.5YR 6/4) fine sand, brown (7.5YR 5/4), moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine irregular pores; noneffervescent; slightly acid, pH 6.4.

Range in Characteristics

Typic Ustipsamments have soil properties that vary greater than family class limits.

A horizon
- Hue: 5YR, 7.5YR, 10YR
- Value: 4 to 6 dry, 3 to 6 moist
- Chroma: 3 to 7 dry, 2 to 4 moist
- Texture: loamy fine sand, fine sandy loam
- Clay: 4 to 12 percent
- Reaction: slightly acid to neutral

C horizons
- Hue: 5YR, 7.5YR, 10YR
- Value: 4 to 6 dry, 3 to 6 moist
- Chroma: 3 to 6, dry or moist
- Texture: fine sand, loamy sand, loamy fine sand
- Clay: 7 to 10 percent
- Reaction: slightly acid to neutral

59—Typic Ustipsamments-Jacks family complex, 1 to 25 percent slopes

Map Unit Setting

Landform(s): structural benches
Elevation: 7,400 to 7,800 feet (2,255 to 2,377 meters)
Mean annual precipitation: 18 to 22 inches (457 to 560 millimeters)
Mean annual air temperature: 45 to 48 degrees F (7.2 to 8.9 degrees C)
Mean annual soil temperature: 47 to 50 degrees F (8.3 to 10.0 degrees C)
Frost-free period: 110 to 130 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-8AZ Colorado Plateau Ponderosa Pine Forests

Map Unit Composition

Typic Ustipsamments and similar soils: 50 percent
Jacks family and similar soils: 30 percent
Minor components: 20 percent
- Manuelito series

- Flutedrock series
- Gullied land

Soil Properties and Qualities

Typic Ustipsamments soils
Taxonomic classification: Typic Ustipsamments
Geomorphic position: occurs on structural benches
Parent material: slope alluvium derived from sandstone and/or eolian sands derived from sandstone
Slope: 1 to 20 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 35 percent
woody debris: 5 percent
bare soil: 55 percent
surface rock fragments
gravel: 5 percent

Drainage class: excessively drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

Available water capacity total inches: 4.9 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: A
Present vegetation: cheatgrass, muttongrass, ponderosa pine, Rocky Mountain juniper, rubber rabbitbrush, twoneedle pinyon
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 18’ 55.00’’ north, 109° 10’ 8.60’’ west

AC—0 to 7 inches (0 to 18 cm); brown (7.5YR 5/4) fine sand, brown (7.5YR 4/4), moist; 3 percent clay; weak medium platy and weak fine granular structure; soft, very friable, nonsticky, nonplastic; common medium, very fine, and fine roots throughout; common medium, very fine, and many fine irregular pores; noneffervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

C1—7 to 35 inches (18 to 89 cm); light brown (7.5YR 6/4) fine sand, brown (7.5YR 5/4), moist; 4 percent clay; massive; soft, very friable, nonsticky, nonplastic; common medium and fine roots throughout; common medium and fine irregular pores; noneffervescent; slightly alkaline, pH 7.4; gradual smooth boundary.

C2—35 to 60 inches (89 to 152 cm); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4), moist; 6 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; common medium and fine roots throughout; common medium and fine irregular pores; noneffervescent; slightly alkaline, pH 7.8.

Range in Characteristics

Typic Ustipsamments have soil properties that very greater than family class limits.

AC horizon
- Hue: 7.5YR, 10YR
- Value: 4 to 5 dry
- Chroma: 3 to 4 dry
- Texture: sand, fine sand, loamy sand, loamy fine sand
- Clay: 2 to 10 percent
- Reaction: neutral to moderately alkaline

C horizons
- Hue: 5YR, 7.5YR, 10YR
- Value: 3 to 6 dry, 4 moist
- Chroma: 3 to 6 dry, 4 moist
- Texture: sand, fine sand, loamy sand, loamy fine sand
- Clay: 2 to 10 percent
- Reaction: neutral to moderately alkaline

Jacks family soils
Taxonomic classification: Fine, mixed, superactive, mesic Typic Haplustalfs
Geomorphic position: occurs on structural benches
Parent material: residuum weathered from sandstone and/or residuum weathered from shale
Slope: 2 to 25 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 55 percent
  - woody debris: 5 percent
  - bare soil: 40 percent
- surface rock fragments

Drainage class: well drained
Ksat solum: 0.06 to 5.95 inches per hour (0.42 to 42.00 micrometers per second)

Available water capacity total inches: 10.3 (very high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: C
Present vegetation: Bigelow sagebrush, ponderosa pine, Rocky Mountain juniper, twoneedle pinyon, Wyoming big sagebrush, yucca
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 18’ 12.10’’ north, 109° 8’ 53.90’’ west

A—0 to 3 inches (0 to 8 cm); yellowish brown (10YR 5/4) very fine sandy loam, brown (10YR 4/3), moist; 16 percent clay; moderate very fine subangular blocky and

moderate medium granular structure; soft, very friable, slightly sticky, slightly plastic; common medium and fine roots throughout; common medium and fine dendritic tubular pores; noneffervescent; slightly alkaline, pH 7.6; abrupt wavy boundary.

Bt1—3 to 7 inches (8 to 18 cm); yellowish brown (10YR 5/4) loam, very dark grayish brown (10YR 3/2), moist; 23 percent clay; moderate very thick platy parts to moderate coarse subangular blocky structure; hard, firm, moderately sticky, slightly plastic; common medium andfine roots throughout; common medium and fine dendritic tubular pores; few distinct very dark grayish brown (10YR 3/2), dry, organic stains on all faces of peds and few faint dark yellowish brown (10YR 4/4), dry, clay films on all faces of peds; noneffervescent; slightly alkaline, pH 7.6; clear wavy boundary.

Bt2—7 to 29 inches (18 to 74 cm); yellowish red (5YR 5/6) clay loam, yellowish red (5YR 4/6), moist; 39 percent clay; moderate coarse subangular blocky structure; very hard, very firm, moderately sticky, moderately plastic; common medium and fine roots throughout; common medium and fine dendritic tubular pores; common prominent yellowish red (5YR 4/6), dry, clay films on all faces of peds; noneffervescent; slightly alkaline, pH 7.8; gradual smooth boundary.

Bk1—29 to 40 inches (74 to 102 cm); reddish yellow (5YR 6/6) sandy clay, yellowish red (5YR 5/6), moist; 41 percent clay; moderate medium subangular blocky structure; very hard, extremely firm, moderately sticky, moderately plastic; few medium roots throughout; few medium dendritic tubular pores; few distinct yellowish red (5YR 4/6), dry, pressure faces on all faces of peds; common fine carbonate masses; 1 percent gravel; strongly effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk2—40 to 60 inches (102 to 152 cm); pink (5YR 7/4) sandy clay loam, reddish yellow (5YR 6/6), moist; 28 percent clay; weak coarse subangular blocky structure; extremely hard, extremely firm, moderately sticky, moderately plastic; few medium roots throughout; many very fine and fine irregular pores; many medium carbonate masses; 10 percent gravel; strongly effervescent, 19 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

Range in Characteristics

Jacks family differs from Jacks series because it contains identifiable secondary calcium carbonate and is very deep to a lithic contact.

Clay content of the control section (weighted average): 35 to 55 percent

A horizon
- Hue: 7.5YR, 10YR
- Value: 3 to 5 dry, 3 moist
- Chroma: 2 to 4 dry, 3 moist
- Texture: loamy sand, sandy loam, very fine sandy loam
- Clay: 4 to 18 percent

Bt horizons
- Hue: 5YR, 7.5YR, 10YR
- Value: 4 to 5 dry, 3 moist
- Chroma: 3 to 6 dry
- Texture: loam, sandy clay loam, clay loam, sandy clay, clay
- Clay: 22 to 55 percent
- Reaction: neutral to moderately alkaline

Bk horizons
- Hue: 5YR
- Value: 5 to 7, dry and moist

Chroma: 4 to 6, dry and moist
Texture: sandy clay loam, clay loam, sandy clay, clay
Clay: 25 to 55 percent
Calcium carbonate equivalent: 15 to 25 percent

Argillic horizon – the zone from 3 to 29 inches (Bt horizons).

Calcic horizon – the the zone from 40 to 60 inches (Bk2 horizon).

60—Urban land-Ives-Jocity complex, sodic, 0 to 3 percent slopes

Map Unit Setting

Landform(s): flood-plain steps
Elevation: 5,200 to 5,600 feet (1,585 to 1,706 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.2 to 13.9 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.3 to 15.0 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-1AZ Colorado Plateau Mixed Grass Plains

Map Unit Composition

Urban lands: 40 percent
Ives and similar soils: 30 percent
Jocity and similar soils: 20 percent
Minor Components: 10 percent
- Aneth and similar soils
- Sheppard and similar soils
- Notal and similar soils
- Marcou and similar soils
- Riverwash
- Jocity and similar soils that have coarser or finer textures in the control section

Soil Properties and Qualities

Urban lands
Slope: 0 to 3 percent

Range in Characteristics

Land mostly covered by streets, parking lots, buildings, and other structures of urban areas.

Ives soils
Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents
Geomorphic position: occurs on talfs on flood-plain steps
Parent material: slope alluvium derived from sandstone and shale and/or eolian sands derived from sandstone and shale over residuum weathered from sandstone and shale
Slope: 0 to 2 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent

moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 20 percent
woody debris: 0 percent
bare soil: 65 percent
surface rock fragments
channer: 15 percent

Drainage class: well drained
Ksat solum: 0.00 to 5.95 inches per hour (0.01 to 42.00 micrometers per second)

Available water capacity total inches: 6.4 (moderate)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: rare
Runoff class: high
Hydrologic group: D
Present vegetation: prickly Russian thistle, shadscale saltbush
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 21’ 39.10’’ north, 109° 37’ 34.60’’ west

Anp1—0 to 6 inches (0 to 15 cm); strong brown (7.5YR 5/6) sandy clay loam, strong brown (7.5YR 5/6), moist; 33 percent clay; weak thin platy structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots and few fine roots throughout; common very fine vesicular pores; 5 percent channer; strongly effervescent; strongly alkaline, pH 8.8; abrupt smooth boundary.

Anp2—6 to 21 inches (15 to 53 cm); strong brown (7.5YR 5/6) sandy clay loam, strong brown (7.5YR 4/6), moist; 24 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots and few fine roots throughout; common very fine vesicular pores; 5 percent channer; violently effervescent; strongly alkaline, pH 8.8; abrupt smooth boundary.

2Cny1—21 to 45 inches (53 to 114 cm); pale brown (10YR 6/3) loamy sand, brown (10YR 5/3), moist; 6 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine roots, few fine roots throughout; common very fine dendritic tubular pores; gypsum, finely disseminated; 10 percent channer; violently effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

2Cny2—45 to 52 inches (114 to 132 cm); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine roots throughout; gypsum, finely disseminated; 5 percent channer; violently effervescent; strongly alkaline, pH 8.6; abrupt wavy boundary.

2Cny3—52 to 60 inches (132 to 152 cm); pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3), moist; 15 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; gypsum, finely disseminated; 5 percent channer; violently effervescent; strongly alkaline, pH 8.6.

Range in Characteristics

Clay content of the control section (weighted average): 5 to 15 percent

Anp horizons
Hue: 7.5YR, 5YR
Value: 4 to 5, dry or moist
Chroma: 3 to 6, dry or moist
Texture: sandy loam, sandy clay loam
Clay: 11 to 36 percent
Sodium adsorption ratio: 20 to 40

2Cny horizons
Hue: 7.5YR, 10YR, 5YR
Value: 5 to 6 dry, 4 to 5 moist
Chroma: 3 to 4, dry or moist
Texture: sand, loamy sand, fine sandy loam, sandy loam, very fine sandy loam, sandy clay loam, clay loam
Clay: 11 to 36 percent
Gypsum: 0 to 4 percent
Sodium adsorption ratio: 90 to 120
Reaction: moderately alkaline to strongly alkaline

Some Anp horizons have been deep tilled to 40 inches (100 cm).

Jocity soils
Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrifluvents
Geomorphic position: occurs on talfs on flood-plain steps
Parent material: slope alluvium derived from sandstone and shale and/or eolian sands derived from sandstone and shale over residuum weathered from sandstone and shale
Slope: 1 to 3 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 25 percent
woody debris: 0 percent
bare soil: 75 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.00 to 0.57 inches per hour (0.01 to 4.00 micrometers per second)

Available water capacity total inches: 10.4 (very high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: rare
Runoff class: very high
Hydrologic group: D
Present vegetation: prickly Russian thistle, shadscale saltbush
Land capability (non irrigated): 7c

Typical Profile

Location
Geographic Coordinate System: 36° 9’ 16.80’’ north, 109° 33’ 30.10’’ west

Anp1—0 to 7 inches (0 to 18 cm); reddish brown (5YR 4/3) clay loam, reddish brown (5YR 4/3), moist; 38 percent clay; massive; extremely hard, extremely firm, very sticky, very plastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Anp2—7 to 24 inches (18 to 61 cm); light brown (7.5YR 6/3) clay loam, brown (7.5YR 4/4), moist; 35 percent clay; massive; extremely hard, firm, very sticky, moderately plastic; common very fine roots throughout; common very fine irregular pores; strongly effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Anp3—24 to 30 inches (61 to 76 cm); light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 4/3), moist; 32 percent clay; massive; moderately hard, friable, moderately sticky, slightly plastic; common very fine roots throughout; common very fine dendritic tubular pores; strongly effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Cny1—30 to 46 inches (76 to 117 cm); reddish brown (2.5YR 5/4) sandy clay loam, red (2.5YR 4/6), moist; 25 percent clay; massive; extremely hard, firm, slightly sticky, slightly plastic; common very fine and fine irregular pores; gypsum, finely disseminated; strongly effervescent; strongly alkaline, pH 8.6; gradual smooth boundary.

Cny2—46 to 60 inches (117 to 152 cm); reddish brown (5YR 5/3) clay, dark reddish brown (5YR 3/3), moist; 48 percent clay; massive; rigid, slightly rigid, very sticky, very plastic; common very fine irregular pores; gypsum, finely disseminated; strongly effervescent; strongly alkaline, pH 8.6.

Range in Characteristics

Clay content of the control section (weighted average): 20 to 30 percent

Anp horizons
- Hue: 7.5YR, 5YR
- Value: 4 to 6, dry or moist
- Chroma: 3 to 6, dry or moist
- Texture: sandy loam, sandy clay loam, clay loam, silty clay loam
- Clay: 16 to 38 percent
- Gypsum: 0 to 4 percent
- Sodium adsorption ratio: 5 to 20
- Reaction: moderately alkaline to strongly alkaline

Cny horizons
- Hue: 7.5YR, 5YR, 10YR, 2.5YR
- Value: 3 to 6 dry, 3 to 4 moist
- Chroma: 3 to 6, dry or moist
- Texture: loamy sand, loamy fine sand, sandy loam, sandy clay loam, clay
- Clay: 10 to 48 percent
- Gypsum: 0 to 4 percent
- Sodium adsorption ratio: 5 to 30
- Reaction: moderately alkaline to strongly alkaline

Some Anp horizons have been deep tilled to 40 inches (100 cm).

61—Ustic Torriorthents-Eslendo-Rock outcrop complex, 15 to 65 percent slopes

Map Unit Setting

Landform(s): escarpments, hills
Elevation: 5,800 to 6,900 feet (1,768 to 2,103 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush – Grasslands

Map Unit Composition

Ustic Torriorthents and similar soils: 30 percent
Eslendo and similar soils: 25 percent
Rock outcrop: 25 percent
Minor Components: 20 percent
- Arches and similar soils
- Mido and similar soils
- Reef and similar soils
- Rizno and similar soils
- Gullied land
- Ustic Torriorthents with very gravelly surfaces

Soil Properties and Qualities

Ustic Torriorthents soils
Taxonomic classification: Ustic Torriorthents
Geomorphic position: occurs on sideslopes of hills, mesas and escarpments
Parent material: residuum weathered from sandstone
Slope: 30 to 65 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 10 percent
    woody debris: 0 percent
    bare soil: 25 percent
  surface rock fragments
    channer: 35 percent
    flagstone: 30 percent
    boulders: 20 percent

Depth to restrictive feature(s): 20 to 40 inches to bedrock, lithic
Drainage class: moderately well drained
Ksat solum: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 2.0 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: high
Hydrologic group: B
Present vegetation: buffaloberry, Ephedra cutleri, pinyon, ricegrass
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 30’ 39.10’’ north, 109° 16’ 57.30’’ west

C—0 to 25 inches (0 to 64 cm); yellowish red (5YR 5/6) very flaggy very fine sandy loam, yellowish red (5YR 4/6), moist; 12 percent clay; massive; soft, very friable, nonsticky, nonplastic; few medium and coarse roots, common very fine and few fine roots throughout; few very fine and fine dendritic tubular pores; 30 percent channer and 20 percent flagstone; violently effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

R—25 to 0 inches (64 to 0 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

Ustic Torriorthents have soil properties that vary greater than family class limits.

C horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6, dry or moist
- Chroma: 4 to 6 dry or moist
- Texture: sandy loam, very fine sandy loam, sandy clay loam
- Clay: 10 to 22 percent
- Reaction: moderately alkaline to strongly alkaline
- Rock fragments: 0 to 50 percent

Some pedons have a Cn horizon that is strongly alkaline.

Eslendo soils
Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents
Geomorphic position: occurs on sideslopes of hills, mesas and escarpments
Parent material: residuum weathered from sandstone and shale
Slope: 15 to 65 percent
Surface cover
- Biological crust
  - cyanobacteria: 0 percent
  - lichen: 0 percent
  - moss: 0 percent
- Chemical crust
  - salt: 0 percent
  - gypsum: 0 percent
- Physical cover
  - canopy plant cover: 2 percent
  - woody debris: 0 percent
  - bare soil: 93 percent
- surface rock fragments
  - channer: 2 percent
  - flagstone: 2 percent
  - stone: 1 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, densic; 3 to 40 inches to bedrock, lithic
Drainage class: somewhat poorly drained
Ksat solum: 0.00 to 0.57 inches per hour (0.01 to 4.00 micrometers per second)
Ksat restrictive layer: 0.00 to 0.06 inches per hour (0.01 to 0.42 micrometers per second)

Available water capacity total inches: 1.1 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: very high
Hydrologic group: D
Present vegetation: California saltbush
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 30’ 2.10’’ north, 109° 17’ 14.00’’ west

C1—0 to 2 inches (0 to 5 cm); red (2.5YR 4/8) clay loam, red (2.5YR 4/6), moist; 30 percent clay; massive; moderately hard, friable, moderately sticky, moderately plastic; common very fine and fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.8; clear wavy boundary.

C2—2 to 6 inches (5 to 15 cm); red (2.5YR 4/6) clay loam, dark red (2.5YR 3/6), moist; 30 percent clay; massive; moderately hard, friable, moderately sticky, moderately plastic; common very fine and fine dendritic tubular pores; violently effervescent; strongly alkaline, pH 8.8; clear wavy boundary.

Cd—6 to 12 inches (15 to 30 cm); red (2.5YR 4/6) clay, reddish brown (2.5YR 4/4), moist; 45 percent clay; massive; extremely hard, slightly rigid; very slightly effervescent; strongly alkaline, pH 8.8; abrupt wavy boundary.

R—12 inches (30 cm); unweathered, fractured sandstone bedrock.

Range in Characteristics

C horizons
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 4 moist
- Chroma: 3 to 8 dry, 6 moist
- Texture: sandy clay loam, clay loam
- Clay: 20 to 35 percent
- Reaction: moderately alkaline to strongly alkaline

Cd horizon
- Hue: 2.5YR, 5YR, 7.5YR
- Value: 4 to 6 dry, 3 to 4 moist
- Chroma: 3 to 6, dry or moist
- Texture: clay loam, clay
- Clay: 30 to 45 percent
- Reaction: moderately alkaline to strongly alkaline

Some pedons have a thin Cr horizon.
Some pedons have a Cn horizon that is strongly alkaline.

Rock outcrop
Slope: 15 to 85 percent

Range in Characteristics

Exposures of steep bedrock and cliffs, typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

62—Ustic Torriorthents-Pits, mine complex, 2 to 35 percent slopes

Map Unit Setting

Landform(s): mesas
Elevation: 6,400 to 6,990 feet (1,950 to 2,130 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to13.3degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush-Grasslands

Map Unit Composition

Ustic Torriorthents and similar soils: 50 percent
Pits, mine, coal: 30 percent
Minor Components: 20 percent
- Rizno and similar soils
- Riverwash
- Moenkopie and similar soils

Soil Properties and Qualities

Ustic Torriorthents soils
Taxonomic classification: Ustic Torriorthents
Geomorphic position: occurs on mesa summits
Parent material: residuum weathered from sandstone and shale
Slope: 2 to 35 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 55 percent
    woody debris: 10 percent
    bare soil: 35 percent
  surface rock fragments

Drainage class: well drained
Ksat solum: 0.57 to 1.98 inches per hour (4.00 to 14.00 micrometers per second)

Available water capacity total inches: 6.3 (moderate)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: medium
Hydrologic group: B

Present vegetation: blackbrush, fourwing saltbush, rabbitbrush, Utah juniper
Land capability (non irrigated): 6c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 32' 23.10'' north, 110° 25' 3.50'' west

Ap—0 to 12 inches (0 to 30 cm); brown (7.5YR 4/4) loam, dark brown (7.5YR 3/4), moist; 20 percent clay; moderate medium granular structure; hard, friable, slightly sticky, slightly plastic; few medium roots and many very fine roots throughout; common very fine interstitial pores; 10 percent gravel and 3 percent cobble; strongly effervescent; neutral, pH 7.3; clear smooth boundary.

C1—12 to 26 inches (30 to 66 cm); grayish brown (10YR 5/2) gravelly loam, gray (10YR 5/1), moist; 24 percent clay; massive; very hard, friable, moderately sticky, moderately plastic; many very fine and fine roots throughout; common very fine interstitial pores; 20 percent gravel, 10 percent cobble, and 1 percent stone; noneffervescent; neutral, pH 7.0; gradual wavy boundary.

C2—26 to 60 inches (66 to 152 cm); dark grayish brown (10YR 4/2) very cobbly loam, very dark grayish brown (10YR 3/2), moist; 24 percent clay; massive; very hard, friable, moderately sticky, moderately plastic; few very fine roots throughout; common very fine interstitial pores; 20 percent gravel, 15 percent cobble, and 1 percent stone; very slightly effervescent; neutral, pH 6.9.

Range in Characteristics

Ustic Torriorthents have soil properties that vary greater than family class limits.

Reclaimed lands: surface strip mining; consist of top soil and over-burden removal and replacement

Ap horizon
- Hue: 7.5YR, 10YR
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 1 to 4 dry, 2 to 4 moist
- Texture: sandy loam, loam, clay loam, clay
- Clay: 12 to 40 percent
- Reaction: neutral or slightly alkaline
- Rock fragments: 5 to 35 percent gravel, 0 to 5 percent cobbles

C horizons
- Hue: 7.5YR, 10YR
- Value: 5 to 7 dry, 3 to 4 moist
- Chroma: 1, 2 or 4 dry, 1 to 4 moist
- Texture: sandy loam, loam, sandy clay loam, clay loam, sandy clay, clay
- Clay: 16 to 45 percent
- Reaction: neutral to slightly alkaline
- Rock fragments: 10 to 50 percent gravel, 5 to 35 percent cobble, 0 to 10 percent stones

Disturbed lands: reclaimed mine lands. Hills and ridges replaced with gradual slopes consisting of mixed earthy materials. Additional soils information can be obtained from The Peabody Western Coal Company, Black Mesa Complex P.O. Box 650, Kayenta, Arizona, 86033.

Pits, mine, coal

Range in Characteristics

Disturbed surface strip mine lands. Wepo Formation sandstone and shale.

63—Ustic Torriorthents-Rock outcrop complex, 2 to 65 percent slopes

Map Unit Setting

Landform(s): escarpments
Elevation: 6,100 to 7,100 feet (1,859 to 2,164 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to13.3 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-3AZ Colorado Plateau Sagebrush-Grasslands

Map Unit Composition

Ustic Torriorthents and similar soils: 80 percent
Rock outcrop: 15 percent
Minor Components: 5 percent
- Lithic Torriorthents and similar soils
- Riverwash
- Gullied land

Soil Properties and Qualities

Ustic Torriorthents soils
Taxonomic classification: Ustic Torriorthents
Geomorphic position: occurs on fan remnants on mesa escarpments
Parent material: colluvium derived from shale and/or colluvium derived from sandstone
Slope: 2 to 65 percent
Surface cover
  Biological crust
    cyanobacteria: 0 percent
    lichen: 0 percent
    moss: 0 percent
  Chemical crust
    salt: 0 percent
    gypsum: 0 percent
  Physical cover
    canopy plant cover: 15 percent
    woody debris: 2 percent
    bare soil: 55 percent
  surface rock fragments
    gravel: 20 percent
    cobble: 5 percent
    stone: 3 percent

Drainage class: well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 6.8 (moderate)

Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none

Runoff class: medium
Hydrologic group: C
Present vegetation: pinyon, Utah juniper

Land capability (non irrigated): 6c

Typical Profile

Typical profile originates from the Soil Survey of Navajo Mountain Area, Arizona, parts of Apache, Coconino, and Navajo Counties.

Location
Geographic Coordinate System: 36° 30’ 30.10’’ north, 110° 4’ 32.00’’ west

A—0 to 6 inches (0 to 15 cm); light olive brown (2.5Y 5/4) very gravelly loam, olive brown (2.5Y 4/4), moist; 15 percent clay; weak very fine granular structure; soft, very friable, slightly sticky, moderately plastic; few very fine and fine roots throughout; few very fine and fine dendritic tubular pores; 35 percent gravel, 10 percent cobble, and 3 percent stone; violently effervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

Ck1—6 to 30 inches (15 to 76 cm); light yellowish brown (2.5Y 6/3) extremely gravelly sandy clay loam, light olive brown (2.5Y 5/4), moist; 30 percent clay; weak coarse subangular blocky structure; moderately hard, friable, moderately sticky, very plastic; few medium, very coarse, very fine, and fine roots throughout; few very fine and fine dendritic tubular pores; common medium and coarse carbonate masses; 40 percent gravel, 15 percent cobble, and 5 percent stone; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Ck2—30 to 42 inches (76 to 107 cm); light yellowish brown (2.5Y 6/4) sandy clay loam, light olive brown (2.5Y 5/4), moist; 30 percent clay; massive; slightly hard, very friable, moderately sticky, very plastic; few very fine and fine roots throughout; few very fine and fine dendritic tubular pores; common fine and medium carbonate masses; 4 percent gravel; violently effervescent, 5 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Ck3—42 to 51 inches (107 to 130 cm); yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4), moist; 15 percent clay; massive; slightly hard, very friable, moderately sticky, very plastic; few very fine and fine roots throughout; common very fine and few fine dendritic tubular pores; common fine carbonate masses; 4 percent gravel; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual smooth boundary.

Ck4—51 to 60 inches (130 to 152 cm); yellowish brown (10YR 5/4) gravelly sandy clay loam, dark yellowish brown (10YR 4/4), moist; 25 percent clay; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots throughout; common very fine dendritic tubular pores; common fine and medium carbonate masses; 20 percent gravel; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

Range in Characteristics

Ustic Torriorthents have soil properties that vary greater than family class limits.

A horizon
- Hue: 7.5YR, 10YR, 2.5Y
- Value: 4 to 6, dry or moist
- Chroma: 2 to 4, dry or moist

Texture: sandy loam, loam
Clay: 8 to 20 percent
Reaction: slightly alkaline to strongly alkaline

Ck horizons
Hue: 7.5YR, 10YR, 2.5Y
Value: 3 to 6, dry or moist
Chroma: 2 to 4, dry or moist
Texture: sandy loam, fine sandy loam, loam, sandy clay loam
Clay: 15 to 30 percent
Reaction: slightly alkaline to strongly alkaline
Calcium carbonate equivalent: 1 to 10 percent (less than 5 percent visible)

Rock outcrop
Slope: 2 to 65 percent

Range in Characteristics

Exposures of flat or rolling bedrock, typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

64—Ustifluventic Haplocambids-Ustic Haplocambids, rocky-Riverwash association, 1 to 70 percent slopes

Map Unit Setting

Landform(s): canyons, channels
Elevation: 5,500 to 6,100 feet (1,676 to 1,865 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 135 to 165 days
Major Land Resource Area: 35 – Colorado Plateau
Land Resource Unit: 35-1AZ Colorado Plateau Mixed Grass Plains

Map Unit Composition

Ustifluventic Haplocambids and similar soils: 40 percent
Ustic Haplocambids, rocky and similar soils: 25 percent
Riverwash: 15 percent
Minor Components: 20 percent
- Mido and similar soils
- Reef and similar soils

Soil Properties and Qualities

Ustifluventic Haplocambids soils
Taxonomic classification: Ustifluventic Haplocambids
Geomorphic position: shale and mudstone derived alluvium on stream terraces and floodplains
Parent material: eolian deposits derived from sandstone over alluvium derived from shale
Slope: 1 to 3 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent

Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 23 percent
woody debris: 2 percent
bare soil: 75 percent
surface rock fragments

Drainage class: well drained
Ksat solum: 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity total inches: 8.8 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: rare
Runoff class: medium
Hydrologic group: C
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 25’ 43.90’’ north, 109° 18’ 51.50’’ west

AC—0 to 3 inches (0 to 8 cm); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4), moist; 15 percent clay; weak medium subangular blocky and moderate thick platy structure; soft, friable, slightly sticky, nonplastic; common medium, very fine, and fine roots throughout; common very fine dendritic tubular pores; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw1—3 to 16 inches (8 to 41 cm); reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4), moist; 29 percent clay; weak very coarse subangular blocky parts to moderate medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common medium, very fine, and fine roots throughout; common medium, very fine, and fine tubular pores; few fine gypsum masses; strongly effervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

Bw2—16 to 35 inches (41 to 89 cm); reddish brown (5YR 5/4) sandy clay loam, dark reddish brown (5YR 3/4), moist; 22 percent clay; weak very coarse subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine roots throughout; common fine tubular pores; few fine gypsum masses; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Cky—35 to 44 inches (89 to 112 cm); reddish yellow (5YR 6/6) fine sandy loam, reddish brown (5YR 4/3), moist; 11 percent clay; massive; soft, very friable, slightly sticky, nonplastic; common very fine roots throughout; common very fine tubular pores; few fine gypsum and carbonate masses; 2 percent gravel; slightly effervescent, 1 percent calcium carbonate equivalent and 1 percent gypsum; moderately alkaline, pH 8.4; clear smooth boundary.

C—44 to 60 inches (112 to 152 cm); yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/3), moist; 8 percent clay; massive; moderately hard, friable, slightly sticky, nonplastic; common very fine roots throughout; common fine dendritic tubular pores; slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Ustifluventic Haplocambids have soil properties that vary greater than family class limits.

Clay content of the control section (weighted average): 12 to 29 percent

AC horizon
Hue: 5YR, 7.5YR
Value: 5 to 6 dry, 4 to 5 moist
Chroma: 3 to 4, dry or moist
Texture: fine sandy loam, loamy fine sand
Clay: 3 to 16 percent

Bw horizons
Hue: 5YR, 7.5YR
Value: 4 to 6 dry,3 to 5 moist
Chroma: 3 to 4, dry or moist
Texture: sandy clay loam, fine sandy loam, loam, clay loam
Clay: 12 to 30 percent
Reaction: moderately alkaline to strongly alkaline

Cky horizon
Hue: 5YR, 7.5YR
Value: 5 to 6 dry, 4 to 5 moist
Chroma: 3 to 6, dry or moist
Texture: fine sandy loam, sandy clay loam, loamy very fine sand, loamy fine sand
Clay: 5 to 30 percent
Reaction: moderately alkaline to strongly alkaline
Calcium carbonate equivalent: 0 to 2 percent
Gypsum: 0 to 2 percent

C horizon
Hue: 5YR, 7.5YR
Value: 5 to 6 dry, 4 to 5 moist
Chroma: 3 to 6, dry or moist
Texture: fine sandy loam, sandy clay loam, loamy very fine sand, loamy fine sand
Clay: 5 to 30 percent
Reaction: moderately alkaline to strongly alkaline

Cambic horizon – the zone from 3 to 35 inches (Bw1 and Bw2 horizons).

Some pedons have an A horizon instead of an AC horizon at the surface.

Ustic Haplocambids, rocky soils
Taxonomic classification: Ustic Haplocambids
Geomorphic position: sandy colluvium and clayey alluvium on canyon escarpments
Parent material: alluvium derived from shale and/or colluvium derived from sandstone
Slope: 20 to 70 percent
Surface cover
Biological crust
cyanobacteria: 0 percent
lichen: 0 percent
moss: 0 percent
Chemical crust
salt: 0 percent
gypsum: 0 percent
Physical cover
canopy plant cover: 30 percent
woody debris: 5 percent
bare soil: 5 percent
surface rock fragments
gravel: 20 percent

cobble: 20 percent
stone: 20 percent

Depth to restrictive feature(s): 20 to 60 inches to bedrock, lithic
Drainage class: somewhat poorly drained
Ksat solum: 0.00 to 5.95 inches per hour (0.01 to 42.00 micrometers per second)
Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 4.9 (low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: very high
Hydrologic group: C
Land capability (non irrigated): 6c

Typical Profile

Location
Geographic Coordinate System: 36° 25’ 39.90’’ north, 109° 19’ 54.80’’ west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) cobbly sandy loam, brown (7.5YR 4/3), moist; 17 percent clay; moderate medium granular and moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; common medium, very fine, and fine roots throughout; common very fine and fine dendritic tubular pores; 10 percent gravel and 10 percent cobble; strongly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Bw—2 to 24 inches (5 to 61 cm); reddish brown (5YR 5/4) very cobbly clay loam, reddish brown (5YR 4/4), moist; 38 percent clay; moderate medium angular blocky structure; hard, friable, moderately sticky, very plastic; common very fine and fine roots throughout; common very fine and fine dendritic tubular pores; 10 percent gravel, 25 percent cobble, and 15 percent stone; strongly effervescent; moderately alkaline, pH 8.2; clear irregular boundary.

C—24 to 36 inches (61 to 91 cm); yellowish red (5YR 5/6) very cobbly clay, reddish brown (5YR 4/3), moist; 50 percent clay; massive; hard, friable, slightly sticky, moderately plastic; common very fine roots throughout; 20 percent gravel, 20 percent cobble, and 15 percent stone; strongly effervescent; moderately alkaline, pH 8.2; abrupt irregular boundary.

R—36 inches (91 cm); fractured, unweathered sandstone bedrock.

Range in Characteristics

Ustic Haplocambids have soil properties that vary greater than family class limits.

Rock fragments of the control section: 35 to 65 percent

A horizon
Hue: 5YR, 7.5YR
Value: 4 to 7 dry, 3 to 6 moist
Chroma: 3 to 4, dry or moist
Texture: sandy loam, loamy fine sand
Clay: 5 to 17 percent

Bw horizon
Hue: 5YR, 7.5YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 4 to 5, dry or moist

Texture: clay loam
Clay: 25 to 40 percent

C horizon
Hue: 5YR, 7.5YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 3to 6, dry or moist
Texture: clay
Clay: 40 to 55 percent

Cambic horizon – the zone from 2 to 24 inches (Bw horizon)

Riverwash
Slope: 1 to 3 percent

Range in Characteristics

Very deep, excessively drained and stratified materials consisting of unstabilized sandy, silty, clayey, and or gravelly sediment that is part of a dynamic inter-braided system of bars and channels. This material is not stable and is subject to shifting and sorting. It is usually dry but can be transformed into a temporary watercourse or a short-lived torrent after large amounts of precipitation or excessive runoff within the watershed. Vegetation is usually not supported because of the constant scouring and shifting of sediments.

65—Water

Map Unit Setting

Major Land Resource Area: 35 – Colorado Plateau

Map Unit Composition

Water: 100 percent

Soil Properties and Qualities

Water

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

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

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

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

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

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

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (USDA, 1961). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive land forming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forestland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels=capability class, subclass, and unit.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, forestland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, 2e-4 and 3e-6. These units are not given in all soil surveys.

The capability classification of map units in this survey area is given in the section “Detailed Soil Map Units” and in the yields table.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation’s short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation’s prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season

or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

There are no soils in the survey area that meet the criteria for Prime Farmland.

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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).

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

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

Alkaline. The accumulation of carbonates in soils commonly derived from calcium but also sodium.

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.

Alluvial flat. A nearly level, graded, alluvial surface in bolsons and semibolsons which commonly does not manifest traceable channels, terraces or flood plain levels.

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 in 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. The major components of an association can be separated at a scale of approximately 1:24,000.

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. Moderately steep to very steep barren land that is dissected by many intermittent drainage channels. Ordinarily, the areas are not stony. Badland is most common in semiarid and arid regions where streams cut into soft geologic material. Local relief generally ranges from 10 and 200 meters in height. Potential runoff is very high, and erosion is active.

Bar. A general term for a ridge-like accumulation of sand, gravel, or other alluvial material formed in the channel, along the banks, or at the mouth of a stream where a decrease in velocity induces deposition; e.g. a channel bar or a meander bar.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology). A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Basin. A low area in the Earth's crust, of tectonic origin, in which sediments have accumulated. A general term for the nearly level to gently sloping, bottom surface of an intermontane basin (bolson). Landforms include playas, broad alluvial flats containing ephemeral drainageways, and relict alluvial and lacustrine surfaces that rarely, if ever, are subject to flooding. Where through-drainage systems are well developed, flood plains are dominant and lake plains are absent or of limited extent. Basin floors grade mountainward to distal parts of piedmont slopes.

Bedding plane. A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

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.

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

Canyon. A long, deep, narrow, very steep-sided valley cut primarily in bedrock with high and precipitous walls in an area of high local relief (e.g., mountain or high plateau terrain), often with a perennial stream at the bottom; similar to but larger than a gorge.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channel. The bed of a single or braided watercourse that commonly is barren of vegetation and is formed of modern alluvium.

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 millimeters 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.

Cliff. Any high, very steep to perpendicular or overhanging face of rock or earth; a precipice.

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, partly rounded, or non flat 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, non-concentrated 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. The major components of a complex cannot be mapped separately at a scale of about 1:24,000.

Concretions. See Redoximorphic features.

Conglomerate. A coarse grained, clastic 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."

Consociations, soil. In a consociation, delineated areas are dominated by a single soil taxon (or miscellaneous area) and similar soils.

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 (geomorphology). A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations). Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cuesta. A hill or ridge that has a gentle slope on one side and a steep slope on the other; specifically, an asymmetric, homoclinal ridge capped by resistant rock layers of slight or moderate dip.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depression. Any relatively sunken part of the Earth's surface; especially a low-lying area surrounded by higher ground. A closed depression has no natural outlet for surface drainage (e.g. a sinkhole). An open depression has a natural outlet for surface drainage.

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.

Desert pavement. A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheet flow have removed all smaller particles or where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion.

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.

Draw. A small stream valley that generally is more open and has broader bottom land than a ravine or gulch.

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.

Dune field. An assemblage of moving and/or stabilized dunes, together with sand plains, interdune areas, and the ponds, lakes, or swamps produced by the blocking of waterways by migrating dunes.

Dune land. Sand in ridges and intervening troughs that shift with the wind.

Earthy fill. See Mine spoil.

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

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit. Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion remnant. A topographic feature that remains or is left standing above the general land surface after erosion has reduced the surrounding area; e.g., a monadnock, a butte, or a stack.

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

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Fan remnant. A general term for a landform that is the remaining part of an older fan landform, such as an alluvial fan, that has been either dissected or partially buried.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven dry weight, after the gravitational, or free, water has drained away;

the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

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

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

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

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, flat fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. The nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain step. An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

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

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

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

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

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 miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Gullied land. Areas where erosion has cut a network of V-shaped or U-shaped channels. The areas resemble miniature badlands. Generally, gullies are so deep that extensive reshaping is necessary for most uses. Small areas can be shown by

spot symbols. Phases that indicate the kind of material remaining may be useful for some areas.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hard to reclaim (in tables). Reclamation is difficult after the removal of soil for construction and other uses. Re-vegetation and erosion control are extremely difficult.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent 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.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Interdune. The relatively flat surface, whether sand-free or sand-covered, between dunes.

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 areal of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron depletions. See Redoximorphic features.

Irrigation. Application of water to soils to assist in production of crops.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Ksat. 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.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Ledge. A narrow shelf or projection of rock, much longer than wide, formed on a rock wall or cliff face.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

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 upland mass characterized by summit widths that are more than the heights of bounding erosional scarps.
Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.
Mine spoil. An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.
Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.
Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.
Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.
Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.
Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that have 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 natural elevation of the land surface, rising more than 1,000 feet 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.
Mountain slope. A part of a mountain between the summit and the foot.
Mountains. A region or landscape characterized by mountains and their intervening valleys.
Mountain slope. A part of a mountain between the summit and the foot.
Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)
Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.
Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.
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. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.
Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Paleoterrace. An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pediment. A gently sloping erosional surface developed at the foot of a receding hill or mountain slope, commonly with a slightly concave-upward profile, that cross-cuts rock or sediment strata that extend beneath adjacent uplands.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

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 (micrometers per second), are as follows:

Impermeable	less than 0.0015 inches
Very slow	0.0015 to 0.06 inches
Slow	0.06 to 0.2 inches
Moderately slow	0.2 to 0.6 inches
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.

Pits. Open excavations from which soil and commonly underlying material have been removed, exposing either rock or other material. Kinds include Pits, mine; Pits, gravel; and Pits, quarry; however, the second term is used only as phase information and not as part of a component name. Commonly, pits are closely associated with Dumps.

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 upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) 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.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings. See Redoximorphic features.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

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

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

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

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. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation. 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, 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, non-cemented 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.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Ridge. A long, narrow elevation of the land surface, usually sharp crested with steep sides and forming an extended upland between valleys. The term is used in areas of both hill and mountain relief.

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.

Riverwash. Unstabilized sandy, silty, clayey, or gravelly sediment that is flooded, washed, and reworked frequently by rivers.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. Exposures of bare bedrock, other than lava flows and rock-lined pits. If needed, map units can be named according to the kind of rock. If this is done, the component name remains Rock outcrop in the database. Examples of these phase terms are Rock outcrop, chalk; Rock outcrop, limestone; and Rock outcrop, gypsum. Many rock outcrops are too small to be delineated as areas on soil maps but can be shown by spot symbols. Some areas are large and are only broken by small areas of soil. Most rock outcrops are hard rock, but some are soft.

Rockiness. Mapunits, consisting of about 0.1 to 10 percent Rock outcrop, can be named either as “rocky” phases or as complexes or associations of soil and Rock outcrop.

Root zone. The part of the soil that can be penetrated by plant roots.

Rubbly. The areas have so many stones at or near the surface that tracked vehicles cannot be used in most places. Usually, these areas have class 4 or 5 stoniness. Percentage of surface covered: 5-15 percent.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface

runoff. Water that enters the soil before reaching surface streams is called groundwater runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs 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 millimeters 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.

Sand sheet. A large, irregularly shaped, commonly thin, surficial mantle of eolian sand, lacking the discernible slip faces that are common on dunes.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturated hydraulic conductivity (Ksat). 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. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils with profiles most 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 formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

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 non-channel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

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

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

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

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil that has enough stones at or near the surface to be a continuing nuisance during operations that mix the surface layer, but does not make such operations impractical. Conventional, wheeled vehicles can move with reasonable freedom over the area.

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.

Structural bench. A platform-like, nearly level to gently inclined erosional surface developed on resistant strata in areas where valleys are cut in alternating strong and weak layers with an essentially horizontal attitude.

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. Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.

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 taxadjunct 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 step-like surface, bordering a valley floor or shoreline, which 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 lever 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.”

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Toeslope. The position that forms 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 step-like landforms, such as successive stream terraces.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Undifferentiated groups. Two or more taxa components that are not consistently associated geographically and, therefore, do not always occur together in the same map delineation or in the same percentage of composition.

Urban land. Land mostly covered by streets, parking lots, buildings, and other structures of urban areas.

Valley. An elongated, relatively large, externally drained depression of the Earth's surface that is primarily the result of stream erosion or glacial activity.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In non-glaciated regions, alluvium deposited by heavily loaded streams.

Valley floor. A general term for the nearly level to gently sloping, lowest surface of a valley.

Valley side. The sloping to very steep surfaces between the valley floor and summits of adjacent uplands.

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

Very Stony. Refers to areas that have so many stones at or near the surface that operations which mix the surface layer either require heavy equipment or use of implements that can operate between the larger stones.

Water. Streams, lakes, ponds, and estuaries. These areas are covered with water in most years, at least during the period that is warm enough for plants to grow. Many areas are covered throughout the year. Pits, blowouts, and playas that contain water most of the time are mapped as Water.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

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