



United States
Department of
Agriculture



Natural
Resources
Conservation
Service

In cooperation with
the Navajo Nation,
the Hopi Nation,
Little Colorado Soil and
Water Conservation
District,
Moenkopi Natural
Resource Conservation
District,
and Arizona Agricultural
Experiment Station.

Soil Survey of the Little Colorado River Area, Arizona, Parts of Coconino and Navajo Counties



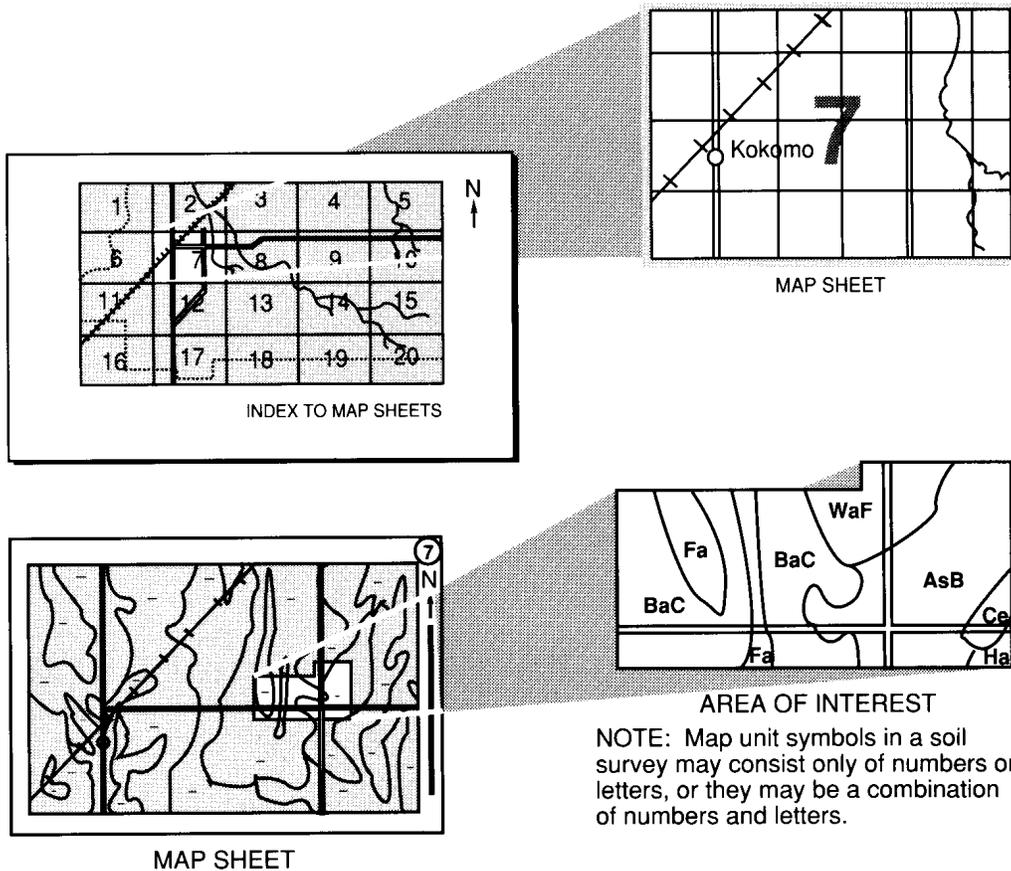
How to Use This Soil Survey

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 unit symbols by symbol and name and shows the page where each map unit is described.



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 2011. Soil names and descriptions were approved in August 2011. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2011. This survey was made cooperatively by the Natural Resources Conservation Service, the Navajo Nation, the Hopi Nation, the Little Colorado Soil and Water Conservation District, the Moenkopi Natural Resource Conservation District, and the Arizona Agricultural Experiment Station. The survey is part of the technical assistance furnished to the Little Colorado Soil and Water Conservation District, the Moenkopi Natural Resource Conservation District, the Navajo Nation, and the Hopi Nation.

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.

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Cover caption

View from the north end of the Grey Mountain Monocline, where soils of map unit 29, Merriwhitica-Wayneco-Tassi family, 5 to 30 percent slopes, are dissected by the Little Colorado River Gorge. In the foreground are the steep slopes of map unit 59, Suzmayne very cobbly sandy loam, 35 to 60 percent slopes.

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

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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 Little Colorado River Area, Parts of Coconino and Navajo Counties

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United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the Navajo Nation, Little Colorado Soil and Water Conservation District, and Arizona Agricultural Experiment Station.

General Nature of the Survey Area

The Little Colorado River Area soil survey covers approximately 2,240,000 acres in northeastern Coconino County and west central Navajo County in Arizona. It includes grazing districts 3 and 5, and the former Bennitt Freeze area (fig. 1).



Figure 1.—Location of Little Colorado River Area in Arizona.

Soil Survey of Little Colorado River Area, Arizona

The area is bounded on the west by the western boundary of the Navajo Indian Reservation, which in the northwest is contiguous with the Marble canyon reach of the Colorado River. It is bounded on the south by the Coconino County Area, Arizona, Central Part soil survey (AZ631) and the Navajo County Area, Arizona, Central Part soil survey (AZ633); on the southeast by the Fort Defiance soil survey (AZ715); on the east by the Hopi Indian Area soil survey (AZ714); and on the northeast by the Echo Cliffs of the Kaibato Plateau. Elevations range from 6,830 feet on the top of Preston Mesa to 3,000 feet near the Little Colorado River.

The surficial geology of the southwest portion of the survey includes areas of moderate extent composed of extrusive igneous rock that may be late Pleistocene in age. West of the Echo Cliffs, the northwest portion of the area is dominated by the Lower Permian Kaibab Limestone of the Marble Platform and by the Coconino Plateau, which includes sandy and dolomitic limestone. South of Tuba city, the Moenkopi Plateau is dominated by the Navajo Sandstone of the Upper Triassic Period and associated eolian soils. Moving west from Ward Terrace, the central portion of the area is dominated by rolling hills and shallow basins that grade into foothills, colluvial slopes, floodplains and badlands developed in the Upper Triassic periods; and by Chinle formations, which include Church Rock, Owl, Petrified Forrest, and Shinarup members.

The major watershed in the survey area is the Little Colorado River. Its tributaries originate in the White Mountains of Arizona and New Mexico and flow north through the Little Colorado River floodplain. The river becomes a deeply incised canyon at Cameron, Arizona, forming the Little Colorado River Gorge before it empties into the Colorado River.

Ranching, farming and tourism are important economic enterprises in the survey area. The ranches are cow-calf enterprises and yearling operations. The survey area has limited acreage of irrigated and non-irrigated cropland. The main factors that restrict land use for crops are low rainfall, droughty soils, and inadequate irrigation.

Transportation Facilities

Two major highways currently serve the survey area. State Highway 89 runs north to south through the Navajo Indian Reservation from Flagstaff to Page, and State Highway 160 runs southwest to northeast from Tuba City to Kayenta. The remainder of the survey is served by Indian Reservation Routes and unpaved roads.

How This Survey Was Made

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

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

degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

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

Soil scientists recorded the characteristics of the soil profiles they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research. Rangeland management specialists identified plant communities and assigned an ecological site to each map unit.

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

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date. After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately. The descriptions, name, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey area.

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 uses.

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

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

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

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

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the

detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Sheppard fine sand, 1 to 5 percent slopes, is a phase of the Sheppard series.

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

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Needle-Sheppard complex, 2 to 12 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Jacanita-Anasazi association, 2 to 20 percent slopes, is an example.

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

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 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" (Soil Survey Staff, 1993).

Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (Soil Survey Staff, 1999) and in "Keys to Soil Taxonomy" (Soil Survey Staff, 2010). 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—Arches-Rock outcrop-Mido complex, 2 to 15 percent slopes

Map Unit Setting

Landform(s): plateaus

Elevation: 5,300 to 5,500 feet (1,615 to 1,676 meters)

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)

Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Arches and similar soils: 40 percent

Rock outcrop: 30 percent

Mido and similar soils: 25 percent

Minor Components: 5 percent

-Active dunes not vegetated

Soil Properties and Qualities

Arches soils

Taxonomic classification: Mixed, mesic Lithic Torripsamments

Geomorphic position: occurs on shallow sand sheets and stabilized dunes overlying sandstone

Parent material: eolian sands over residuum weathered from sandstone

Slope: 2 to 5 percent

Surface cover

Biological crust

-cyanobacteria: 5 percent

-lichen: 0 percent

-moss: 0 percent

Chemical crust

-salt: 0 percent

-gypsum: 0 percent

Soil Survey of Little Colorado River Area, Arizona

Physical cover

- canopy plant cover: 30 percent
- woody debris: 0 percent
- bare soil: 65 percent
- rock fragments
- gravel: 3 percent

Depth to restrictive feature(s): 8 to 20 inches to bedrock, lithic

Drainage class: excessively drained

Ksat solum: 5.95 to 19.98 inches per hour (42.00 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: 0.6 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: negligible

Hydrologic group: D

Ecological site name: Sandstone Upland 10-14" p.z. Calcareous

Ecological site number: R035XC333AZ

Present vegetation: Utah juniper, black grama, blue grama, *Ephedra*, narrowleaf yucca, oneseed juniper, bird's-beak, blackbrush, broom snakeweed, galleta, sandhill muhly, spike dropseed

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 19' 13.20" north, 111° 23' 5.70" west

C1—0 to 2 inches (0 to 5 cm); yellowish red (5YR 5/6) sand, yellowish red (5YR 4/6), moist; 4 percent clay; single grain; loose, nonsticky, nonplastic; few very fine and fine roots; few fine interstitial pores; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

C2—2 to 5 inches (5 to 13 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 5 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and few fine roots; few very fine and fine tubular pores; noneffervescent; slightly alkaline, pH 7.6; abrupt wavy boundary.

C3—5 to 10 inches (13 to 25 cm); red (2.5YR 5/6) loamy sand, red (2.5YR 4/6), moist; 7 percent clay; massive; loose, slightly sticky, nonplastic; few medium and fine and common very fine roots; common very fine and fine tubular pores; noneffervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

R—10 inches (25 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Particle-size control section clay content: 3 to 6 percent

C horizon

Hue: 5YR, 2.5YR

Value: 4 or 5, dry or moist

Chroma: 6, dry or moist

Texture: sand, fine sand, loamy sand

Clay: 2 to 7 percent

Calcium carbonate equivalent: 0 to 5 percent

Reaction: slightly alkaline to moderately alkaline

Rock outcrop

Slope: 2 to 25 percent

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.

Mido soils

Taxonomic classification: Mixed, mesic Ustic Torripsamments

Geomorphic position: occurs on sand sheets and stabilized dunes overlying sandstone

Parent material: eolian sands derived from sandstone

Slope: 2 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: 30 percent

-woody debris: 0 percent

-bare soil: 65 percent

rock fragments: 0 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: 4.2 (low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: negligible

Hydrologic group: A

Ecological site name: Sandy Upland 10-14" p.z. Calcareous (CORA)

Ecological site number: R035XC373AZ

Present vegetation: *Ephedra*, sand sagebrush, broom snakeweed, sandhill muhly, bird's-beak, blue grama, buckwheat eriogonum, mesa dropseed, narrowleaf yucca, oneseed juniper, spike dropseed, Utah juniper

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 18' 44.40" north, 111° 21' 53.30" west

C1—0 to 2 inches (0 to 5 cm); yellowish red (5YR 5/6) sand, yellowish red (5YR 4/6), moist; 3 percent clay; single grain; loose, nonsticky, nonplastic; few very fine and fine roots; few fine interstitial pores; noneffervescent; slightly alkaline, pH 7.6; gradual wavy boundary.

C2—2 to 35 inches (5 to 89 cm); yellowish red (5YR 5/6) sand, yellowish red (5YR 4/6), moist; 3 percent clay; massive; soft, loose, nonsticky, nonplastic; few medium, coarse, and fine roots; few very fine and fine tubular pores; noneffervescent; moderately alkaline, pH 8.0; gradual wavy boundary.

C3—35 to 60 inches (89 to 152 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 3 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots; few very fine tubular pores; slightly

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effervescent, 3 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual wavy boundary.

Range in Characteristics

Particle-size control section clay content: 3 to 5 percent

C horizon

- Hue: 5YR, 2.5YR
- Value: 4 or 5, dry or moist
- Chroma: 6, dry or moist
- Texture: sand, fine sand
- Clay: 3 to 5 percent
- Calcium carbonate equivalent: 0 to 5 percent
- Reaction: slightly alkaline to strongly alkaline

Some pedons have subsurface Cn horizons with a pH of 9.0.

2—Aut-Cross association, 0 to 15 percent slopes

Map Unit Setting

Landform(s): plateaus

Elevation: 5,400 to 6,600 feet (1,646 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 12.0 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: 35-3 Colorado Plateau Sagebrush - Grasslands

Map Unit Composition

Aut and similar soils: 60 percent

Cross and similar soils: 30 percent

Minor Components: 10 percent

- Fine Calcic Argiustolls and similar soils
- Fine Aridic Haplusterts and similar soils
- Rock outcrop

Soil Properties and Qualities

Aut soils

Taxonomic classification: Fine-loamy, carbonatic, mesic Ustic Haplocalcids

Geomorphic position: occurs on mesas and plateaus

Parent material: alluvium derived from basalt and/or limestone

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: 10 percent

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-bare soil: 70 percent
rock fragments: 0 percent
Depth to restrictive feature(s): 20 to 40 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 0.57 to 1.98 inches per hour (4.00 to 14.00 micrometers per second)
Ksat restrictive layer: 0.00 to 19.98 inches per hour (0.00 to 141.00 micrometers per second)
Available water capacity total inches: 4.4 (low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: C
Ecological site name: Loamy Upland 10-14" p.z.
Ecological site number: R035XA113AZ
Present vegetation: winterfat, blue grama, needle and thread, alkali sacaton, black grama, bottlebrush squirreltail, galleta, Indian ricegrass, oneseed juniper, sand dropseed, threeawn
Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Coconino County Area, Arizona, Central Part.

Location

Geographic Coordinate System: 35° 29' 52.47" north, 112° 11' 22.21" west

A1—0 to 2 inches (0 to 5 cm); brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3), moist; 15 percent clay; weak thin platy parts to weak very fine granular structure; slightly hard, very friable, nonsticky, nonplastic; many fine roots; common very fine and fine vesicular, and common very fine and fine irregular pores; 15 percent gravel; strongly effervescent, 22 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

A2—2 to 7 inches (5 to 18 cm); brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3), moist; 20 percent clay; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; many very fine roots; few fine tubular and irregular pores; 15 percent gravel; strongly effervescent, 27 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear wavy boundary.

A3—7 to 12 inches (18 to 30 cm); brown (10YR 4/3) cobbly loam, dark brown (10YR 3/3), moist; 20 percent clay; moderate medium subangular blocky and weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; many very fine roots; few fine tubular and irregular pores; 20 percent cobble; violently effervescent, 34 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; gradual wavy boundary.

Bk1—12 to 17 inches (30 to 43 cm); brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3), moist; 20 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine roots; few fine tubular pores; 20 percent gravel; violently effervescent, 44 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; gradual wavy boundary.

Bk2—17 to 26 inches (43 to 66 cm); light brownish gray (10YR 6/2) very cobbly loam, yellowish brown (10YR 5/4), moist; 20 percent clay; massive; slightly hard, friable, slightly sticky, nonplastic; many very fine roots; 20 percent gravel and 15 percent cobble; violently effervescent, 41 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; diffuse broken boundary.

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Bk3—26 to 38 inches (66 to 97 cm); very dark gray (2.5Y 3/1) very cobbly loam, black (2.5Y 2.5/1), moist; 20 percent clay; massive; slightly hard, friable, slightly sticky, slightly plastic; many very fine roots; common carbonate concretions on bottom of rock fragments; 15 percent gravel and 20 percent cobble; violently effervescent, 66 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

R—38 inches (97 cm); fractured, unweathered basalt bedrock.

Range in Characteristics

Aut, as used in this survey, is a taxadjunct to the series because it has an ustic aridic moisture regime. Aut series is a Fine-loamy, carbonatic, mesic, Aridic Calcicustolls.

Rock fragments of the control section: 29 to 35 percent gravels and cobbles
Particle-size control section clay content: 18 to 25 percent

A horizon

Hue: 7.5YR, 10YR
Value: 4 or 5 dry, 3 moist
Chroma: 3, dry or moist
Texture: loam
Clay: 15 to 25 percent
Calcium carbonate equivalent: 0 to 10 percent
Rock fragments: 15 to 30 percent gravels and cobbles
Reaction: moderately alkaline

Bk horizon

Hue: 2.5Y, 10YR
Value: 2.5 to 6 dry, 3 to 5 moist
Chroma: 1 to 4, dry or moist
Texture: loam
Clay: 18 to 25 percent
Calcium carbonate equivalent: 10 to 70 percent
Rock fragments: 15 to 50 percent gravels and cobbles
Reaction: moderately alkaline

Calcic horizon: the zone from 17 to 38 inches (44 to 97 cm), (Bk2 and Bk3 horizons)

Cross soils

Taxonomic classification: Clayey, smectitic, mesic Lithic Calcicargids

Geomorphic position: occurs on mesas and plateaus

Parent material: colluvium and/or alluvium derived from basalt and/or pyroclastic rock

Slope: 8 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: 20 percent
-woody debris: 10 percent
-bare soil: 70 percent
rock fragments: 0 percent

Depth to restrictive feature(s): 8 to 20 inches to bedrock, lithic

Drainage class: moderately well drained

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Ksat solum: 0.06 to 0.57 inches per hour (0.42 to 4.00 micrometers per second)
Ksat restrictive layer: 0.00 to 19.98 inches per hour (0.00 to 141.00 micrometers per second)
Available water capacity total inches: 2.5 (very low)
Shrink-swell potential: about 7.5 LEP (high)
Flooding hazard: none
Runoff class: very high
Hydrologic group: D
Ecological site name: Shallow Loamy 10-14" p.z.
Ecological site number: R035XA119AZ
Present vegetation: sideoats grama, blue grama, galleta, black grama, New Mexico feathergrass, oneseed juniper, bottlebrush squirreltail
Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Coconino County Area, Arizona, Central Part.

Location

Geographic Coordinate System: 35° 19' 15.15" north, 112° 45' 54.38" west

A—0 to 3 inches (0 to 8 cm); dark grayish brown (10YR 4/2) gravelly clay loam, very dark grayish brown (10YR 3/2), moist; 30 percent clay; moderate fine granular structure; slightly hard, friable, moderately sticky, moderately plastic; few fine roots; many very fine interstitial pores; 20 percent gravel and 5 percent cobble; noneffervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bt—3 to 10 inches (8 to 25 cm); brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2), moist; 45 percent clay; weak fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; few very fine interstitial and tubular pores; many clay films on all faces of peds; 10 percent gravel; noneffervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

Btk—10 to 14 inches (25 to 36 cm); pinkish gray (7.5YR 6/2) clay, brown (7.5YR 5/4), moist; 45 percent clay; moderate fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; few very fine interstitial and tubular pores; few clay films on all faces of peds; many carbonate concretions on bottom of rock fragments; 10 percent gravel; strongly effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Ck—14 to 19 inches (36 to 48 cm); white (10YR 8/1) cobbly clay loam, light gray (10YR 7/1), moist; 35 percent clay; massive; hard, firm, moderately sticky, moderately plastic; few very fine roots; few very fine tubular pores; 30 percent cobble; violently effervescent, 60 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt irregular boundary.

R—19 inches (48 cm); fractured, unweathered basalt bedrock.

Range in Characteristics

Cross, as used in this survey, is a taxadjunct to the series because it has an ustic aridic moisture regime. Cross series is a Clayey, smectitic, mesic Aridic Lithic Argiustolls.

Rock fragments of the control section: 5 to 12 percent gravels and cobbles
Particle-size control section clay content: 37 to 55 percent

A horizon

Hue: 7.5YR, 10YR

Value: 3 or 4, dry or moist

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Chroma: 2, dry or moist
Texture: clay loam
Clay: 30 to 35 percent
Calcium carbonate equivalent: 0 to 2 percent
Rock fragments: 51 to 30 percent gravels and cobbles
Reaction: moderately alkaline

Bt, Btk horizons

Hue: 7.5YR, 10YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 2 to 4, dry or moist
Texture: clay, clay loam
Clay: 35 to 55 percent
Calcium carbonate equivalent: 0 to 25 percent
Rock fragments: 5 to 12 percent gravels
Reaction: moderately alkaline

Ck horizon

Hue: 7.5YR, 10YR
Value: 7 or 8, dry or moist
Chroma: 1, dry or moist
Texture: clay loam
Clay: 30 to 40 percent
Calcium carbonate equivalent: 15 to 60 percent
Rock fragments: 15 to 34 percent cobbles
Reaction: moderately alkaline

Argillic horizon: the zone from 3 to 14 inches (8 to 36 cm), (Bt and Btk horizons)

Calcic horizon: the zone from 10 to 19 inches (25 to 48 cm), (Btk and Ck horizons)

3—Begay-Mido-Milok complex, 1 to 5 percent slopes

Map Unit Setting

Landform(s): fan terraces

Elevation: 5,400 to 5,970 feet (1,646 to 1,820 meters)

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)

Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Begay and similar soils: 35 percent

Mido and similar soils: 30 percent

Milok and similar soils: 30 percent

Minor Components: 5 percent

-Fine-loamy, mixed, mesic Ustic Haplocambids

Soil Properties and Qualities

Begay soils

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids

Geomorphic position: occurs on summits of fan terrace on narrow valley sides

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Parent material: alluvium derived from sandstone and siltstone and/or eolian deposits

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: 10 percent

-bare soil: 60 percent

rock fragments

gravel: 5 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: 6.9 (moderate)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: low

Hydrologic group: A

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

Ecological site number: R035XC317AZ

Present vegetation: blue grama, galleta, pricklypear, needle and thread, Indian ricegrass, bottlebrush squirreltail, *Ephedra*

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 28' 24.40" north, 111° 33' 35.90" west

A—0 to 2 inches (0 to 4 cm); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6), moist; 8 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common very fine roots; few very fine irregular pores; 1 percent gravel; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bw1—2 to 9 inches (4 to 23 cm); red (2.5YR 5/6) fine sandy loam, red (2.5YR 4/6), moist; 12 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine and few fine tubular pores; 1 percent gravel; strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

Bw2—9 to 15 inches (23 to 38 cm); red (2.5YR 5/6) fine sandy loam, red (2.5YR 4/6), moist; 14 percent clay; moderate coarse subangular blocky structure; moderately hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine and few fine tubular pores; 4 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear wavy boundary.

Bkn1—15 to 22 inches (38 to 56 cm); red (2.5YR 5/6) sandy loam, red (2.5YR 4/6), moist; 14 percent clay; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine and few fine tubular pores; common carbonate masses in matrix; 7 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear wavy boundary.

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Bkn2—22 to 35 inches (56 to 89 cm); red (2.5YR 5/6) sandy loam, red (2.5YR 4/6), moist; 12 percent clay; massive; hard, friable, slightly sticky, slightly plastic; common very fine roots; common very fine and few fine tubular pores; common carbonate masses in matrix; 3 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 9.0; clear smooth boundary.

Bkn3—35 to 53 inches (89 to 135 cm); red (2.5YR 5/6) sandy loam, red (2.5YR 4/6), moist; 13 percent clay; massive; moderately hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine and few fine tubular pores; many carbonate masses in matrix; violently effervescent, 10 percent calcium carbonate equivalent; very strongly alkaline, pH 9.2; gradual smooth boundary.

Cn1—53 to 62 inches (135 to 157 cm); red (2.5YR 5/6) sandy loam, red (2.5YR 4/6), moist; 13 percent clay; massive; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; few very fine and fine tubular pores; violently effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 9.0; clear smooth boundary.

Cn2—62 to 66 inches (157 to 168 cm); red (2.5YR 5/6) fine sandy loam, red (2.5YR 4/6), moist; 12 percent clay; moderate medium and coarse subangular blocky structure; moderately hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine irregular pores; violently effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 9.0; clear smooth boundary.

Range in Characteristics

Rock fragments of the control section: 0 to 8 percent gravels

Particle-size control section clay content: 12 to 17 percent

A horizon

Hue: 5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 6 or 8, dry or moist

Texture: loamy fine sand, sandy loam

Clay: 6 to 10 percent

Calcium carbonate equivalent: 0 to 2 percent

Rock fragments: 0 to 3 percent gravels

Reaction: moderately alkaline

Bw horizon

Hue: 2.5YR, 5YR

Value: 4 or 5, dry or moist

Chroma: 6 or 8, dry or moist

Texture: fine sandy loam, sandy loam, very fine sandy loam, loamy very fine sand

Clay: 10 to 18 percent

Calcium carbonate equivalent: 0 to 4 percent

SAR: 0 to 4

Rock fragments: 0 to 8 percent gravels

Reaction: moderately alkaline to strongly alkaline

Bkn horizon

Hue: 2.5YR, 5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 6 or 8, dry or moist

Texture: sandy loam, fine sandy loam, very fine sandy loam

Clay: 12 to 18 percent

Calcium carbonate equivalent: 5 to 15 percent

SAR: 2 to 12

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Rock fragments: 0 to 12 percent gravels
Reaction: strongly alkaline to very strongly alkaline

Cn horizon

Hue: 2.5YR, 5YR
Value: 4 or 5, dry or moist
Chroma: 6 or 8, dry or moist
Texture: sandy loam, loamy sand, fine sandy loam
Clay: 8 to 13 percent
Calcium carbonate equivalent: 0 to 4 percent
SAR: 5 to 12
Rock fragments: 0 to 10 percent gravels
Reaction: strongly alkaline

Cambic horizon: the zone from 2 to 15 inches (4 to 38 cm), (Bw horizon)

Mido soils

Taxonomic classification: Mixed, mesic Ustic Torripsamments

Geomorphic position: occurs on stabilized dunes and coppice mounds

Parent material: alluvium derived from sandstone and siltstone and/or eolian deposits

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: 20 percent
-woody debris: 10 percent
-bare soil: 70 percent
rock fragments: 0 percent

Drainage class: excessively drained

Ksat solum: 1.98 to 99.92 inches per hour (14.00 to 705.00 micrometers per second)

Available water capacity total inches: 5.9 (moderate)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very low

Hydrologic group: A

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

Ecological site number: R035XC315AZ

Present vegetation: *Ephedra*, blue grama, sand sagebrush, needle and thread, Indian ricegrass, galleta, *Sporobolus*, sandhill muhly

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 28' 0.42" north, 111° 33' 36.00" west

A—0 to 3 inches (0 to 8 cm); reddish yellow (5YR 6/6) sand, yellowish red (5YR 4/6), moist; 5 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; few very fine tubular pores; noneffervescent; moderately alkaline, pH 8.2; clear smooth boundary.

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C1—3 to 35 inches (8 to 89 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6), moist; 8 percent clay; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine roots; few very fine tubular pores; very slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual smooth boundary.

C2—35 to 60 inches (89 to 152 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6), moist; 10 percent clay; massive; soft, very friable, slightly sticky, nonplastic; common very fine roots; few very fine tubular pores; 2 percent gravel; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.8.

Range in Characteristics

Rock fragments of the control section: 0 to 5 percent gravels

Particle-size control section clay content: 5 to 12 percent

A horizon

Hue: 2.5YR, 5YR

Value: 4 or 6, dry or moist

Chroma: 6 or 8, dry or moist

Texture: sand, fine sand

Clay: 4 to 6 percent

Reaction: slightly alkaline to moderately alkaline

C horizon

Hue: 2.5YR, 5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 to 8, dry or moist

Texture: loamy fine sand, loamy sand, sand

Clay: 2 to 12 percent

Calcium carbonate equivalent: 0 to 2 percent

SAR: 0 to 4

Rock fragments: 0 to 10 percent gravels

Reaction: moderately alkaline to strongly alkaline

Milok soils

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids

Geomorphic position: occurs on summits of fan terrace on narrow valley sides

Parent material: alluvium derived from sandstone and siltstone and/or eolian deposits

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: 10 percent

-bare soil: 60 percent

rock fragments: 0 percent

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: 5.9 (moderate)

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Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very low

Hydrologic group: A

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

Ecological site number: R035XC317AZ

Present vegetation: blue grama, galleta, pricklypear, needle and thread, Indian ricegrass, bottlebrush squirreltail, *Ephedra*

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 26' 13.30" north, 111° 32' 38.80" 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; weak medium platy structure; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; few very fine irregular pores; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear wavy boundary.

Bky—3 to 20 inches (8 to 51 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 12 percent clay; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and common fine roots; common very fine and few fine tubular pores; common carbonate masses in matrix and common gypsum masses in matrix; violently effervescent, 10 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.2; gradual wavy boundary.

Bk1—20 to 45 inches (51 to 114 cm); red (2.5YR 5/6) fine sandy loam, red (2.5YR 4/6), moist; 14 percent clay; moderate coarse prismatic structure; hard, friable, slightly sticky, slightly plastic; common fine roots; common very fine and few fine tubular pores; common carbonate masses in matrix; violently effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual wavy boundary.

Bk2—45 to 60 inches (114 to 152 cm); red (2.5YR 5/6) gravelly loamy sand, red (2.5YR 4/6), moist; 8 percent clay; massive; loose, nonsticky, nonplastic; common fine roots; few fine interstitial pores; common carbonate masses in matrix; 25 percent gravel and 8 percent cobble; violently effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear wavy boundary.

Range in Characteristics

Rock fragments of the control section: 0 to 8 percent gravels

Particle-size control section clay content: 12 to 18 percent

A horizon

Hue: 2.5YR, 5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 6 or 8, dry or moist

Texture: loamy fine sand, sandy loam

Clay: 8 to 10 percent

Calcium carbonate equivalent: 0 to 4 percent

Reaction: slightly alkaline to moderately alkaline

Bky, Bk horizons

Hue: 2.5YR, 5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 6 or 8, dry or moist

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Texture: fine sandy loam, very fine sandy loam, sandy loam, loam
Clay: 12 to 20 percent
Calcium carbonate equivalent: 5 to 15 percent
SAR: 0 to 4
Gypsum: 0 to 4 percent
Rock fragments: 0 to 10 percent gravels
Reaction: moderately alkaline to strongly alkaline

Bk horizon

Hue: 2.5YR, 5YR
Value: 4 or 5, dry or moist
Chroma: 4 or 6, dry or moist
Texture: loamy sand, sandy loam, fine sandy loam, very fine sandy loam
Clay: 8 to 18 percent
Calcium carbonate equivalent: 5 to 15 percent
SAR: 0 to 4
Rock fragments: 3 to 33 percent gravels and cobbles
Reaction: strongly alkaline

Cambic horizon: the zone from 3 to 20 inches (8 to 50 cm), (Bky horizon)

Calcic horizon: the zone from 20 to 45 inches (8 to 113 cm), (Bky, Bk horizon)

Some pedons have Cn horizons instead of a Bk2 horizon.

4—Berto-Nepalto family-Lava flows complex, 4 to 35 percent slopes

Map Unit Setting

Landform(s): hillslopes, lava flows
Elevation: 4,590 to 4,920 feet (1,400 to 1,500 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Berto and similar soils: 40 percent
Nepalto family and similar soils: 35 percent
Lava flows: 10 percent
Minor Components: 15 percent
-Epikom and similar soils
-Tsaya and similar soils

Soil Properties and Qualities

Berto soils

Taxonomic classification: Loamy, mixed, superactive, mesic Lithic Calcicargids
Geomorphic position: occurs on hills on lava flows
Parent material: colluvium derived from basalt over residuum weathered from basalt
Slope: 4 to 8 percent
Surface cover:
Biological crust

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-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: 60 percent
rock fragments
 gravel: 60 percent
 cobble: 30 percent
 stone: 5 percent
Depth to restrictive feature(s): 16 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: 0.01 to 20.00 inches per hour (0.07 to 141.14 micrometers per second)
Available water capacity total inches: 2.3 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: medium
Hydrologic group: D
Ecological site name: Basalt Upland 6-10" p.z.
Ecological site number: R035XB231AZ
Present vegetation: porcupine pricklypear, *Sphaeralcea*, shadscale saltbush, broom snakeweed
Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 59' 39.00" north, 111° 27' 16.00" west

A—0 to 1 inch (0 to 3 cm); brown (7.5YR 5/4) extremely gravelly fine sandy loam, brown (7.5YR 4/4), moist; 10 percent clay; strong thin platy structure; soft, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine vesicular pores; 40 percent gravel, 20 percent cobble, and 3 percent stone; strongly effervescent, 12 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Bt—1 inch to 4 inches (3 to 10 cm); dark brown (7.5YR 3/4) loam, dark brown (7.5YR 3/4), moist; 23 percent clay; strong fine subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; common very fine roots; many very fine irregular pores; few clay films on all faces of peds; strongly effervescent, 12 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Btk—4 to 7 inches (10 to 18 cm); dark brown (7.5YR 3/4) loam, dark brown (7.5YR 3/4), moist; 23 percent clay; strong fine subangular blocky structure; moderately hard, friable, moderately sticky, moderately plastic; few medium and fine roots; common fine tubular pores; few clay films on all faces of peds; many carbonate masses in matrix and common carbonate concretions on bottom of rock fragments; 2 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear smooth boundary.

Soil Survey of Little Colorado River Area, Arizona

Bk—7 to 18 inches (18 to 46 cm); pink (7.5YR 7/4) gravelly loam, light brown (7.5YR 6/3), moist; 21 percent clay; massive; moderately hard, friable, slightly sticky, slightly plastic; few medium and fine roots; few medium and fine tubular pores; common carbonate, finely disseminated and many carbonate masses in matrix, and common carbonate concretions on bottom of rock fragments; 20 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear wavy boundary.

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

Range in Characteristics

Rock fragments of the control section: 0 to 5 percent gravels

Particle-size control section clay content: 18 to 28 percent

A horizon

Hue: 7.5YR

Value: 5 dry, 4 moist

Chroma: 4, dry or moist

Texture: fine sandy loam, sandy loam

Clay: 5 to 15 percent

Calcium carbonate equivalent: 10 to 15 percent

Rock fragments: 50 to 75 percent gravels, cobbles, and stones

Reaction: strongly alkaline

Bt horizon

Hue: 7.5YR

Value: 3 or 4, dry or moist

Chroma: 4, dry or moist

Texture: loam, sandy clay loam

Clay: 18 to 28 percent

Calcium carbonate equivalent: 10 to 15 percent

SAR: 0 to 4

Rock fragments: 0 to 5 percent gravels

Reaction: strongly alkaline

Btk horizon

Hue: 7.5YR

Value: 3 or 4, dry or moist

Chroma: 4, dry or moist

Texture: loam, sandy clay loam

Clay: 18 to 28 percent

Calcium carbonate equivalent: 15 to 25 percent

SAR: 0 to 4

Rock fragments: 0 to 5 percent gravels

Reaction: strongly alkaline

Bk horizon

Hue: 7.5YR

Value: 7 dry, 6 moist

Chroma: 3 or 4, dry or moist

Texture: loam, sandy clay loam, sandy loam

Clay: 16 to 26 percent

Calcium carbonate equivalent: 15 to 25 percent

SAR: 0 to 4

Rock fragments: 15 to 25 percent gravels

Reaction: strongly alkaline

Soil Survey of Little Colorado River Area, Arizona

Argillic horizon: the zone from 1 to 7 inches (3 to 18 cm), (Bt, Btk horizons)

Calcic horizon: the zone from 4 to 18 inches (10 to 46 cm), (Btk, Bk horizons)

Nepalito family soils

Taxonomic classification: Sandy-skeletal, mixed, mesic Typic Torriorthents

Geomorphic position: occurs on hills on lava flows

Parent material: calcareous loess derived from sedimentary rock over colluvium derived from basalt

Slope: 8 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: 20 percent

-woody debris: 0 percent

-bare soil: 80 percent

rock fragments

gravel: 70 percent

cobble: 20 percent

Drainage class: well drained

Ksat solum: 0.57 to 99.92 inches per hour (4.00 to 705.00 micrometers per second)

Available water capacity total inches: 2.9 (low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: low

Hydrologic group: B

Ecological site name: Cinder Hills 6-10" p.z.

Ecological site number: R035XB282AZ

Present vegetation: Anderson wolfberry, shadscale saltbush, *Sphaeralcea*

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 59' 13.00" north, 111° 28' 21.00" west

A1—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) extremely gravelly loam, brown (7.5YR 4/4), moist; 18 percent clay; strong thin platy structure; moderately hard, friable, moderately sticky, moderately plastic; few very fine roots; many very fine and fine vesicular pores; 50 percent gravel and 10 percent cobble; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

A2—2 to 8 inches (5 to 20 cm); brown (7.5YR 4/4) gravelly loam, dark brown (7.5YR 3/4), moist; 22 percent clay; moderate medium subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; few medium and common very fine and fine roots; common fine tubular pores; common carbonate, finely disseminated; 25 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

C1—8 to 18 inches (20 to 46 cm); pink (7.5YR 7/3) very gravelly loamy sand, light brown (7.5YR 6/4), moist; 5 percent clay; massive; moderately hard, friable, nonsticky, nonplastic; few very fine roots; few very fine tubular pores; common carbonate, finely disseminated; 40 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

C2—18 to 60 inches (46 to 152 cm); brown (7.5YR 5/4) very gravelly loamy sand, brown (7.5YR 4/4), moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; many coarse interstitial pores; common carbonate, finely disseminated; 50 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

Range in Characteristics

Nepalto family differs from the series because it has hues of 7.5YR to 10YR, slopes greater than 8 percent, and formed in volcanic parent material on lava flows.

Rock fragments of the control section: 37 to 70 percent gravels and cobbles
Particle-size control section clay content: 3 to 6 percent

A horizon

Hue: 7.5YR, 10YR
Value: 4 or 5 dry, 3 or 4 moist
Chroma: 4, dry or moist
Texture: loam, sandy loam
Clay: 18 to 25 percent
Calcium carbonate equivalent: 15 to 30 percent
Rock fragments: 25 to 65 percent gravels and cobbles
Reaction: moderately alkaline

C horizon

Hue: 7.5YR, 10YR
Value: 5 to 7 dry, 4 to 6 moist
Chroma: 3 or 4 dry, 4 moist
Texture: loamy sand, sand,
Clay: 2 to 8 percent
Calcium carbonate equivalent: 15 to 30 percent
SAR: 0 to 4
Rock fragments: 35 to 80 percent gravels and cobbles
Reaction: strongly alkaline

Lava flows

Slope: 15 to 90 percent

Typically have sharp, jagged surfaces, crevices, and angular blocks that are characteristic of lava. A little earthy material may be in a few rocks and sheltered pockets, but the flows are virtually devoid of vegetation with the exception of lichens.

5—Cataract-Tsaya-Typic Calciargids complex, 4 to 15 percent slopes

Map Unit Setting

Landform(s): fan remnants

Elevation: 3,080 to 5,070 feet (938 to 1,546 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Soil Survey of Little Colorado River Area, Arizona

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Cataract and similar soils: 30 percent

Tsaya and similar soils: 25 percent

Typic Calciargids and similar soils: 25 percent

Minor Components: 20 percent

-Seeg and similar soils

-Lithic Calciargids and similar soils

-Badland

Soil Properties and Qualities

Cataract soils

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Typic Calciargids

Geomorphic position: occurs on footslopes of fan remnants

Parent material: slope alluvium derived from limestone and sandstone over residuum weathered from limestone and sandstone

Slope: 4 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: 70 percent

-woody debris: 0 percent

-bare soil: 30 percent

rock fragments

gravel: 5 percent

Depth to restrictive feature(s): 20 to 31 inches to bedrock, lithic

Drainage class: well 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: 2.8 (low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: high

Hydrologic group: C

Ecological site name: Kaibab Formation Limestone/Sandstone Upland 6-10" p.z.

Ecological site number: R035XB232AZ

Present vegetation: shadscale saltbush, *Ephedra*, pricklypear, broom snakeweed, galleta, fluffgrass

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 46' 53.00" north, 111° 37' 16.00" west

Soil Survey of Little Colorado River Area, Arizona

C—0 to 2 inches (0 to 5 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 2 percent clay; single grain; soft, loose, nonsticky, nonplastic; few very fine roots; few very fine irregular pores; noneffervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bw—2 to 10 inches (5 to 25 cm); red (2.5YR 5/6) loamy fine sand, red (2.5YR 4/6), moist; 5 percent clay; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few medium, very fine and few fine roots; few very fine and fine tubular pores; 5 percent gravel; strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt irregular boundary.

Btk1—10 to 19 inches (25 to 48 cm); red (2.5YR 5/6) gravelly very fine sandy loam, red (2.5YR 4/6), moist; 18 percent clay; moderate coarse and very coarse subangular blocky structure; moderately hard, friable, moderately sticky, moderately plastic; few medium, very fine, and fine roots; few very fine vesicular and very fine and fine tubular pores; common clay films on all faces of peds; many carbonate masses in matrix; 15 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear irregular boundary.

Btk2—19 to 25 inches (48 to 63 cm); red (2.5YR 5/6) gravelly loam, red (2.5YR 4/6), moist; 20 percent clay; moderate medium subangular blocky structure; moderately hard, friable, moderately sticky, moderately plastic; few very fine roots; few very fine tubular pores; common clay films on all faces of peds; many carbonate masses in matrix; 15 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

R—25 inches (63 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 10 to 20 percent gravels

Particle-size control section clay content: 18 to 23 percent

C horizon

Hue: 5YR

Value: 5 dry, 4 moist

Chroma: 6, dry or moist

Texture: fine sand, fine sandy loam

Clay: 1 to 10 percent

Reaction: moderately alkaline to strongly alkaline

Bw horizon

Hue: 2.5YR, 5YR

Value: 5 dry, 4 moist

Chroma: 6, dry or moist

Texture: loamy fine sand, fine sandy loam

Clay: 5 to 10 percent

Calcium carbonate equivalent: 0 to 4 percent

Rock fragments: 0 to 10 percent gravels

Reaction: moderately alkaline to strongly alkaline

Btk horizon

Hue: 2.5YR, 5YR

Value: 5 dry, 4 moist

Chroma: 6, dry or moist

Texture: very fine sandy loam, loam

Clay: 13 to 23 percent

Calcium carbonate equivalent: 15 to 25 percent

Soil Survey of Little Colorado River Area, Arizona

Rock fragments: 15 to 20 percent gravels
Reaction: moderately alkaline to strongly alkaline

Argillic horizon: the zone from 10 to 25 inches (25 to 63 cm), (Btk horizon)

Calcic horizon: the zone from 10 to 25 inches (25 to 63 cm), (Btk horizon)

Tsaya soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Torriorthents

Geomorphic position: occurs on terraces of fan remnants

Parent material: colluvium derived from mudstone over residuum weathered from calcareous sandstone

Slope: 4 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: 65 percent

-woody debris: 0 percent

-bare soil: 35 percent

rock fragments

channer: 55 percent

flagstone: 1 percent

Depth to restrictive feature(s): 4 to 20 inches to bedrock, lithic

Drainage class: well drained

Ksat solum: 0.57 to 1.98 inches per hour (4.00 to 14.00 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: 0.7 (very low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: medium

Hydrologic group: D

Ecological site name: Mudstone/Sandstone Hills 6-10" p.z. CORA

Ecological site number: R035XB251AZ

Present vegetation: shadscale saltbush, *Ephedra*, galleta, blackbrush acacia, turpentine broom

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 43' 45.00" north, 111° 38' 8.00" west

C1—0 to 2 inches (0 to 5 cm); yellowish red (5YR 4/6) very channery loam, dark reddish brown (5YR 3/4), moist; 23 percent clay; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots; common very fine vesicular, few very fine and fine tubular, and few fine vesicular pores; 55 percent channer; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Soil Survey of Little Colorado River Area, Arizona

C2—2 to 9 inches (5 to 23 cm); yellowish red (5YR 4/6) very channery loam, dark reddish brown (5YR 3/4), moist; 23 percent clay; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots; common very fine vesicular and few very fine and fine tubular pores; 50 percent channer; strongly effervescent, 5 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

R—9 inches (23 cm); unfractured, unweathered sandstone and mudstone bedrock.

Range in Characteristics

Rock fragments of the control section: 37 to 56 percent channers

Particle-size control section clay content: 18 to 25 percent

C horizon

Hue: 5YR

Value: 4 dry, 3 moist

Chroma: 6 dry, 4 moist

Texture: loam, sandy clay loam

Clay: 18 to 25 percent

Calcium carbonate equivalent: 0 to 10 percent

Rock fragments: 35 to 60 percent channers

Reaction: moderately alkaline to strongly alkaline

Typic Calciargid soils

Taxonomic classification: Loamy-skeletal, mixed, mesic Typic Calciargids

Geomorphic position: occurs on terraces on fan remnants

Parent material: slope alluvium derived from limestone and sandstone over residuum weathered from limestone and sandstone

Slope: 4 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: 65 percent

-woody debris: 0 percent

-bare soil: 35 percent

rock fragments

gravel: 20 percent

cobble: 20 percent

stone: 5 percent

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: 2.3 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very low

Hydrologic group: A

Ecological site name: Sandy Loam Upland 6-10" p.z. Calcareous

Ecological site number: R035XB235AZ

Soil Survey of Little Colorado River Area, Arizona

Present vegetation: blackbrush, galleta, shadscale saltbush, *Ephedra*, black grama, fluffgrass, pricklypear, sand dropseed, spiny phlox
Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 46' 40.65" north, 111° 36' 29.48" west

A—0 to 1 inch (0 to 3 cm); red (2.5YR 5/6) very cobbly fine sandy loam, dark red (2.5YR 3/6), moist; 8 percent clay; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine roots; common very fine vesicular pores; 20 percent gravel, 20 percent cobble, and 5 percent stone; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Bky1—1 inch to 4 inches (3 to 10 cm); red (2.5YR 5/6) very gravelly sandy loam, dark red (2.5YR 3/6), moist; 8 percent clay; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine and few fine roots; few very fine vesicular pores; few carbonate masses in matrix and few gypsum masses in matrix; 35 percent gravel and 5 percent cobble; violently effervescent, 15 percent calcium carbonate equivalent and 2 percent gypsum; strongly alkaline, pH 8.6; abrupt wavy boundary.

Bky2—4 to 17 inches (10 to 43 cm); yellowish red (5YR 4/6) very cobbly sandy loam, yellowish red (5YR 4/6), moist; 8 percent clay; moderate medium and coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common very fine and medium roots; common very fine and fine vesicular pores; common carbonate masses in matrix and few gypsum masses in matrix; 10 percent gravel and 30 percent cobble; strongly effervescent, 20 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.4; abrupt wavy boundary.

Btk—17 to 35 inches (43 to 89 cm); red (2.5YR 5/6) extremely cobbly sandy loam, dark red (2.5YR 3/6), moist; 11 percent clay; strong coarse and very coarse subangular blocky structure; very hard, friable, slightly sticky, slightly plastic; few very fine and fine roots; many very fine and common fine vesicular and few fine tubular pores; common clay films on all faces of peds; many carbonate masses in matrix and many carbonate concretions on bottom of rock fragments; 25 percent gravel, 35 percent cobble, and 5 percent stone; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual wavy boundary.

Bk—35 to 46 inches (89 to 117 cm); red (2.5YR 5/6) extremely stony sandy loam, red (2.5YR 4/6), moist; 8 percent clay; massive; slightly hard, friable, slightly sticky, nonplastic; few very fine and fine roots; many very fine and common fine vesicular pores; common carbonate masses in matrix and many carbonate concretions on bottom of rock fragments; 20 percent gravel, 30 percent cobble, 20 percent stone, and 10 percent boulder; violently effervescent, 15 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear wavy boundary.

C—46 to 60 inches (117 to 152 cm); red (2.5YR 5/6) extremely gravelly coarse sand, red (2.5YR 4/6), moist; 2 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; common fine irregular pores; 45 percent gravel and 20 percent cobble; slightly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.8.

Range in Characteristics

The Typic Calciargids soils mapped in this survey have properties that vary outside of the family class limits.

Soil Survey of Little Colorado River Area, Arizona

Rock fragments of the control section: 55 to 90 percent gravels, cobbles, and stones
Particle-size control section clay content: 6 to 18 percent

A horizon

Hue: 2.5YR
Value: 5 dry, 3 moist
Chroma: 6, dry or moist
Texture: fine sandy loam, sandy loam
Clay: 6 to 12 percent
Calcium carbonate equivalent: 0 to 4 percent
Rock fragments: 30 to 70 percent gravels, cobbles, and stones
Reaction: moderately alkaline

Bky horizon

Hue: 2.5YR, 5YR
Value: 4 to 5 dry, 3 moist
Chroma: 6 dry, 4 to 6 moist
Texture: sandy loam
Clay: 6 to 15 percent
Calcium carbonate equivalent: 15 to 25 percent
Gypsum: 0 to 2 percent
Rock fragments: 25 to 90 percent gravels, cobbles, and stones
Reaction: moderately alkaline to strongly alkaline

Btk, Bk horizon

Hue: 2.5YR
Value: 4 to 5 dry, 3 moist
Chroma: 6, dry or moist
Texture: sandy loam, fine sandy loam
Clay: 6 to 18 percent
Calcium carbonate equivalent: 15 to 25 percent
Rock fragments: 55 to 90 percent gravels, cobbles, and stones
Reaction: strongly alkaline

C horizon

Hue: 2.5YR
Value: 5 dry, 4 moist
Chroma: 6, dry or moist
Texture: coarse sand, sandy loam
Clay: 1 to 5 percent
Calcium carbonate equivalent: 0 to 4 percent
Rock fragments: 55 to 85 percent gravels, cobbles, and stones
Reaction: strongly alkaline

Argillic horizon: the zone from 17 to 35 inches (43 to 89 cm), (Btk horizon)

Calcic horizon: the zone from 4 to 46 inches (10 to 117 cm), (Bk, Btk horizons)

Some pedons have slight gypsum accumulation in the Bk horizon.

6—Claysprings-Huerfano-Tuba complex, 2 to 15 percent slopes

Map Unit Setting

Landform(s): structural benches

Elevation: 4,140 to 5,330 feet (1,261 to 1,625 meters)

Soil Survey of Little Colorado River Area, Arizona

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Claysprings and similar soils: 40 percent
Huerfano and similar soils: 30 percent
Tuba and similar soils: 15 percent
Minor Components: 15 percent
-Badland
-Hanksville and similar soils
-Ives and similar soils

Soil Properties and Qualities

Claysprings soils

Taxonomic classification: Clayey, smectitic, calcareous, mesic, shallow Typic Torriorthents

Geomorphic position: occurs on backslopes on structural benches

Parent material: residuum weathered from sandstone and shale

Slope: 4 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: 5 percent

-woody debris: 0 percent

-bare soil: 95 percent

rock fragments

gravel: 20 percent

Depth to restrictive feature(s): 4 to 22 inches to bedrock, paralithic; 8 to 22 inches to bedrock, lithic

Drainage class: well drained

Ksat solum: 0.06 to 0.20 inches per hour (0.42 to 1.40 micrometers per second)

Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.41 micrometers per second)

Available water capacity total inches: 0.9 (very low)

Shrink-swell potential: about 7.5 LEP (high)

Flooding hazard: rare

Ponding hazard: rare

Runoff class: high

Hydrologic group: D

Ecological site name: Mudstone Slopes 6-10" p.z.

Ecological site number: R035XB283AZ

Present vegetation: alkali sacaton, mound saltbush, shadscale saltbush

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 30' 26.50" north, 110° 54' 26.20" west

A—0 to 2 inches (0 to 4 cm); light reddish brown (5YR 6/3) clay loam, reddish brown (5YR 5/3), moist; 35 percent clay; moderate coarse subangular blocky structure; moderately hard, friable, moderately sticky, moderately plastic; few very fine roots; common very fine irregular pores; 6 percent gravel; strongly effervescent, 10 percent calcium carbonate equivalent and 2 percent gypsum; strongly alkaline, pH 9.0; abrupt smooth boundary.

C—2 to 6 inches (4 to 15 cm); pinkish gray (5YR 6/2) clay, reddish brown (5YR 5/3), moist; 42 percent clay; moderate thick platy structure; moderately hard, friable, moderately sticky, moderately plastic; few very fine roots; common very fine irregular pores; 5 percent gravel; strongly effervescent, 15 percent calcium carbonate equivalent and 2 percent gypsum; strongly alkaline, pH 8.8; clear irregular boundary.

CR—6 to 10 inches (15 to 25 cm); fractured, weathered shale bedrock.

R—10 inches (25 cm); unfractured, unweathered shale bedrock.

Range in Characteristics

Rock fragments of the control section: 1 to 10 percent gravels

Particle-size control section clay content: 30 to 42 percent

A, C horizons

Hue: 2.5YR, 5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 2 to 4 dry, 3 or 4 moist

Texture: clay loam, clay, sandy clay, sandy clay loam

Clay: 30 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Gypsum: 0 to 4 percent

SAR: 2 to 12

Rock fragments: 0 to 10 percent gravels

Reaction: strongly alkaline to very strongly alkaline

Some pedons do not have the lithic bedrock contact.

Surface cracking with 1-inch-wide cracks 3 inches deep across the soil surface.

Huerfano soils

Taxonomic classification: Loamy, mixed, superactive, mesic, shallow Typic Natrargids

Geomorphic position: occurs on footslopes on structural benches

Parent material: alluvium over residuum weathered 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: 5 percent

-woody debris: 0 percent

Soil Survey of Little Colorado River Area, Arizona

-bare soil: 95 percent
rock fragments
 gravel: 15 percent
 cobble: 2 percent
Depth to restrictive feature(s): 4 to 18 inches to bedrock, paralithic; 8 to 18 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: 0.00 to 0.20 inches per hour (0.00 to 1.41 micrometers per second)
Available water capacity total inches: 0.7 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: rare
Ponding hazard: rare
Runoff class: high
Hydrologic group: D
Ecological site name: Shale Upland 6-10" p.z.
Ecological site number: R035XB220AZ
Present vegetation: alkali sacaton, mound saltbush, shadscale saltbush, Indian ricegrass
Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 31' 3.70" north, 110° 55' 25.30" west

A—0 to 1 inch (0 to 3 cm); reddish brown (5YR 5/3) gravelly sandy loam, reddish brown (5YR 4/3), moist; 14 percent clay; weak medium platy structure; loose, nonsticky, nonplastic; common very fine and fine roots; common very fine tubular pores; 15 percent gravel; slightly effervescent, 5 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.0; abrupt wavy boundary.

Btn—1 inch to 5 inches (3 to 13 cm); reddish brown (5YR 5/3) sandy clay loam, reddish brown (5YR 4/3), moist; 25 percent clay; strong coarse prismatic structure; hard, friable, slightly sticky, slightly plastic; common coarse, very fine, and fine roots; common very fine and fine tubular pores; few clay films on all faces of peds and few clay bridges between sand grains; strongly effervescent, 10 percent calcium carbonate equivalent and 2 percent gypsum; very strongly alkaline, pH 9.4; clear wavy boundary.

CR—5 to 17 inches (13 to 43 cm); fractured, weathered shale bedrock.

R—17 inches (43 cm); unfractured, unweathered shale bedrock.

Range in Characteristics

Rock fragments of the control section: 0 to 20 percent gravels

Particle-size control section clay content: 18 to 30 percent

A horizon

Hue: 2.5YR, 5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 to 6, dry or moist

Texture: sandy loam, loamy sand, fine sandy loam

Clay: 10 to 18 percent

Calcium carbonate equivalent: 2 to 10 percent

Gypsum: 0 to 4 percent

SAR: 0 to 4

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Rock fragments: 10 to 20 percent gravels
Reaction: moderately alkaline to strongly alkaline

Btn horizon

Hue: 2.5YR, 5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 3 to 6, dry or moist
Texture: sandy clay loam, clay loam
Clay: 18 to 30 percent
Calcium carbonate equivalent: 10 to 15 percent
Gypsum: 0 to 4 percent
SAR: 13 to 20
Rock fragments: 0 to 20 percent gravels
Reaction: strongly alkaline to very strongly alkaline

Natric horizon: the zone from 1 to 5 inches (3 to 12 cm), (Btn horizon)

Some pedons do not have the surface A horizon.

Tuba soils

Taxonomic classification: Mixed, mesic Typic Torripsamments

Geomorphic position: occurs on summits on structural benches

Parent material: eolian sands over residuum weathered from sandstone and shale

Slope: 4 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: 20 percent

-woody debris: 0 percent

-bare soil: 80 percent

rock fragments: 0 percent

Depth to restrictive feature(s): 47 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: 0.00 to 0.06 inches per hour (0.00 to 0.42 micrometers per second)

Available water capacity total inches: 3.3 (low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: low

Hydrologic group: A

Ecological site name: Sandy Upland 6-10" p.z. Sodic

Ecological site number: R035XB223AZ

Present vegetation: alkali sacaton, fourwing saltbush, Russian-thistle

Land capability (non irrigated): 7c

Typical Profile

Location

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Geographic Coordinate System: 35° 55' 45.70" north, 111° 21' 19.40" west

C1—0 to 4 inches (0 to 10 cm); light reddish brown (5YR 6/3) sand, reddish brown (5YR 5/3), moist; 3 percent clay; single grain; loose, nonsticky, nonplastic; common very fine and fine roots; common fine interstitial pores; strongly effervescent, 5 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; gradual smooth boundary.

C2—4 to 29 inches (10 to 74 cm); light reddish brown (5YR 6/3) sand, reddish brown (5YR 5/3), moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; common fine interstitial pores; slightly effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; gradual smooth boundary.

C3—29 to 50 inches (74 to 127 cm); light reddish brown (5YR 6/3) sand, reddish brown (5YR 5/3), moist; 3 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; few very fine and fine roots; common fine interstitial pores; slightly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt wavy boundary.

Btknb—50 to 52 inches (127 to 132 cm); reddish brown (5YR 5/3) sandy clay loam, reddish brown (5YR 4/3), moist; 28 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; common very fine irregular pores; very few clay bridges between sand grains and very few clay films on all faces of peds; few carbonate masses in matrix; 5 percent gravel; strongly effervescent, 5 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt smooth boundary.

R—52 inches (132 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Particle-size control section clay content: 1 to 6 percent

C horizon

Hue: 5YR

Value: 5 or 6, dry or moist

Chroma: 3 or 4, dry or moist

Texture: sand, loamy sand

Clay: 1 to 6 percent

Calcium carbonate equivalent: 0 to 5 percent

Reaction: slightly alkaline to strongly alkaline

Btknb horizon

Hue: 5YR

Value: 4 or 5, dry or moist

Chroma: 3 or 4, dry or moist

Texture: sandy clay loam, loam

Clay: 20 to 35 percent

Calcium carbonate equivalent: 0 to 5 percent

SAR: 0 to 4

Rock fragments: 0 to 10 percent gravels

Reaction: moderately alkaline to strongly alkaline

7—Endoaquolls-Haplofibrists-Psammaquents complex, 0 to 3 percent slopes

Map Unit Setting

Landform(s): flood plains

Elevation: 4,880 to 5,050 feet (1,488 to 1,540 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Endoaquolls and similar soils: 25 percent

Haplofibrists and similar soils: 25 percent

Psammaquents and similar soils: 25 percent

Minor Components: 25 percent

-Ives similar soils that have a water table between 20 and 40 inches

Soil Properties and Qualities

Endoaquolls soils

Taxonomic classification: Sandy, mixed, mesic Endoaquolls

Geomorphic position: occurs on canyon bottom flood plains

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: 20 percent

-woody debris: 10 percent

-bare soil: 70 percent

rock fragments: 0 percent

Drainage class: very 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: 10.5 (very high)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: occasional

Seasonal water table minimum depth: about 0 to 6 inches

Runoff class: very low

Hydrologic group: A/D

Ecological site name: Loamy Bottom 6-10" p.z. Subirrigated, Saline

Ecological site number: R035XB212AZ

Present vegetation: reedgrass, inland saltgrass, sedge, rush

Land capability (irrigated): 4w

Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 36° 10' 20.30" north, 111° 12' 3.57" west

Ap—0 to 10 inches (0 to 25 cm); brown (7.5YR 5/3) loamy fine sand, dark brown (7.5YR 3/2), moist; 6 percent clay; cloddy structure; slightly hard, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

C1—10 to 20 inches (25 to 51 cm); pink (7.5YR 7/3) fine sand, brown (7.5YR 5/3), moist; 1 percent clay; single grain; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores; noneffervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C2—20 to 40 inches (51 to 102 cm); pinkish gray (7.5YR 6/2) loamy fine sand, brown (7.5YR 4/2), moist; 6 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores; noneffervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Oeb—40 to 60 inches (102 to 152 cm); brown (7.5YR 5/2) peaty loamy fine sand, dark brown (7.5YR 3/2), moist; 1 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; noneffervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Endoaquolls have soil properties that vary outside of family class limits.

Particle-size control section clay content: 1 to 7 percent

A horizon

Hue: 10YR, 7.5YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 2 to 4 dry, 1 to 3 moist
Texture: loamy fine sand
Clay: 2 to 10 percent
Calcium carbonate equivalent: 0 to 2 percent
Reaction: moderately alkaline to strongly alkaline

C horizon

Hue: 10YR, 7.5YR
Value: 4 to 7 dry, 3 to 5 moist
Chroma: 2 to 4 dry, 1 to 3 moist
Texture: loamy fine sand, sand, fine sand
Clay: 0 to 10 percent
Calcium carbonate equivalent: 0 to 2 percent
Reaction: moderately alkaline

O horizon

Hue: 10YR, 7.5YR
Value: Mineral 3 to 6 dry, 2.5 to 4 moist; Organic Matter 2.5 to 5, dry or moist
Chroma: Mineral 1 to 3, dry or moist; Organic Matter 1 or 2, dry or moist
Texture: mineral part 10 to 50 percent, loamy fine sand, loamy very fine sand, fine sand
Clay: 0 to 1 percent
Calcium carbonate equivalent: 0 to 2 percent
Reaction: moderately alkaline

Mollic epipedon: the zone from 0 to 8 inches (0 to 20 cm), (Ap horizon)

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Aquic conditions: the zone from 16 to 60 inches (40 to 150 cm), (C and 2Oeb horizons)

Haplofibrists soils

Taxonomic classification: Mesic Haplofibrists

Geomorphic position: occurs on canyon bottom flood plains

Parent material: organic material

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: 10 percent

-bare soil: 70 percent

rock fragments: 0 percent

Drainage class: very poorly drained

Ksat solum: 5.95 to 99.92 inches per hour (42.00 to 705.00 micrometers per second)

Available water capacity total inches: 25.2 (very high)

Shrink-swell potential: about 0.0 LEP (low)

Flooding hazard: occasional

Seasonal water table minimum depth: about 0 to 6 inches

Runoff class: negligible

Hydrologic group: A/D

Ecological site name: Loamy Bottom 6-10" p.z. Subirrigated, Saline

Ecological site number: R035XB212AZ

Present vegetation: rush, broadleaf cattail, sedge

Land capability (irrigated): 4w

Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 36° 9' 53.76" north, 111° 12' 12.38" west

Oi—0 to 3 inches (0 to 8 cm); pinkish gray (7.5YR 6/2) peaty sand, dark brown (7.5YR 3/2), moist; 1 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; many fine vesicular and tubular pores; 1 percent iron-manganese masses; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Oe1—3 to 10 inches (8 to 25 cm); dark gray (7.5YR 4/1) mucky sand, black (7.5YR 2.5/1), moist; 1 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; many fine vesicular and tubular pores; noneffervescent; neutral, pH 7.2; clear smooth boundary.

Oe2—10 to 17 inches (25 to 43 cm); very dark gray (7.5YR 3/1) peaty sand, black (7.5YR 2.5/1), moist; 1 percent clay; slightly hard, very friable, nonsticky, nonplastic; many fine vesicular and tubular pores; noneffervescent; neutral, pH 7.2; clear smooth boundary.

Oe3—17 to 72 inches (43 to 183 cm); very dark gray (7.5YR 3/1) peaty sand, black (7.5YR 2.5/1), moist; 1 percent clay; slightly hard, very friable, nonsticky, nonplastic; many fine vesicular and tubular pores; noneffervescent; neutral, pH 7.2.

Range in Characteristics

Haplofibrists have soil properties that vary outside of family class limits.

Particle-size control section clay content: 0 to 1 percent

O horizon

Hue: 10YR, 7.5YR

Value: 2.5 to 6, dry or moist

Chroma: 1 or 2, dry or moist

Texture: sandy peat, sandy muck, peaty sand, mucky sand

Clay: 0 to 1 percent

Calcium carbonate equivalent: 0 to 2 percent

Reaction: neutral to slightly alkaline

Aquic conditions: the zone from 0 to 72 inches (0 to 180 cm), (O horizon)

Organic soil materials: the zone from 3 to 72 inches (8 to 180 cm), (O horizon)

Psammaquents soils

Taxonomic classification: Mixed, mesic Psammaquents

Geomorphic position: occurs on canyon bottom flood plains

Parent material: eolian sands over alluvium derived from sandstone and siltstone

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: 10 percent

-bare soil: 70 percent

rock fragments: 0 percent

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: 9.0 (high)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: occasional

Seasonal water table minimum depth: about 12 to 24 inches

Runoff class: negligible

Hydrologic group: A/D

Ecological site name: Loamy Bottom 6-10" p.z. Subirrigated, Saline

Ecological site number: R035XB212AZ

Present vegetation: rush, sedge

Land capability (irrigated): 4w

Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 36° 9' 12.71" north, 111° 12' 18.37" west

Ap—0 to 10 inches (0 to 25 cm); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/4), moist; 6 percent clay; massive; slightly hard, very friable, nonsticky,

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nonplastic; many very fine and fine roots; many very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt smooth boundary.

C1—10 to 16 inches (25 to 41 cm); light brown (7.5YR 6/3) loamy fine sand, brown (7.5YR 4/3), moist; 6 percent clay; single grain; slightly hard, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

C2—16 to 27 inches (41 to 69 cm); pink (7.5YR 7/4) loamy fine sand, brown (7.5YR 5/4), moist; 6 percent clay; single grain; loose, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

C3—27 to 55 inches (69 to 140 cm); pink (7.5YR 7/4) loamy fine sand, brown (7.5YR 4/4), moist; 6 percent clay; single grain; hard, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores; noneffervescent; neutral, pH 7.2; abrupt smooth boundary.

Oeb—55 to 65 inches (140 to 165 cm); black (7.5YR 2.5/1) peaty fine sand, black (7.5YR 2.5/1), moist; 1 percent clay; hard, very friable, nonsticky, nonplastic; common very fine and fine roots; many very fine and fine irregular pores; noneffervescent; neutral, pH 7.2.

Range in Characteristics

Psammaquents have soil properties that vary outside of family class limits.

Particle-size control section clay content: 2 to 10 percent

A horizon

Hue: 10YR, 7.5YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 4 to 6, dry or moist
Texture: loamy fine sand
Clay: 2 to 10 percent
Calcium carbonate equivalent: 0 to 2 percent
Reaction: slightly alkaline to strongly alkaline

C horizon

Hue: 10YR, 7.5YR
Value: 5 to 7 dry, 4 to 5 moist
Chroma: 2 to 4, dry or moist
Texture: loamy fine sand
Clay: 2 to 10 percent
Calcium carbonate equivalent: 0 to 2 percent
Reaction: neutral to slightly alkaline

O horizon

Hue: 10YR, 7.5YR
Value: 2.5 to 6, dry or moist
Chroma: 1 or 2, dry or moist
Texture: sandy peat, sandy muck, peaty fine sand
Clay: 0 to 1 percent
Calcium carbonate equivalent: 0 to 2 percent
Reaction: neutral to slightly alkaline

Aquic conditions: the zone from 27 to 55 inches (69 to 140 cm), (C3horizon)

Some pedons do not have the buried Oe horizon.

8—Epikom-Leupp complex, 2 to 15 percent slopes

Map Unit Setting

Landform(s): structural benches

Elevation: 4,220 to 5,430 feet (1,285 to 1,655 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Epikom and similar soils: 50 percent

Leupp and similar soils: 35 percent

Minor Components: 15 percent

-Lithic Haplargids and similar soils

-Typic Torriorthents and similar soils

-Rock outcrop

Soil Properties and Qualities

Epikom soils

Taxonomic classification: Loamy, mixed, superactive, mesic Lithic Haplocambids

Geomorphic position: occurs on mesas and plateaus

Parent material: residuum weathered from calcareous 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: 50 percent

-woody debris: 0 percent

-bare soil: 50 percent

rock fragments

channer: 60 percent

Depth to restrictive feature(s): 16 to 19 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 0.57 inches per hour (0.00 to 4.00 micrometers per second)

Available water capacity total inches: 1.3 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: low

Hydrologic group: D

Ecological site name: Sandstone/Shale Upland 6-10" p.z.

Ecological site number: R035XB215AZ

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Present vegetation: galleta, alkali sacaton, black grama, Bigelow sagebrush, blue grama, fourwing saltbush, bottlebrush squirreltail
Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 13' 42.20" north, 110° 57' 26.10" west

A—0 to 2 inches (0 to 5 cm); light reddish brown (5YR 6/3) channery sand, reddish brown (5YR 5/3), moist; 2 percent clay; single grain; loose, nonsticky, nonplastic; many very fine roots; many very fine interstitial pores; 20 percent channer and 5 percent flagstone; violently effervescent, 15 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Bw1—2 to 6 inches (5 to 15 cm); light reddish brown (5YR 6/3) channery sandy loam, reddish brown (5YR 5/3), moist; 17 percent clay; weak medium platy structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine roots; many very fine irregular pores; common carbonate masses in matrix; 30 percent channer; violently effervescent, 15 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual smooth boundary.

Bw2—6 to 17 inches (15 to 43 cm); yellowish red (5YR 5/6) very channery fine sandy loam, yellowish red (5YR 4/6), moist; 16 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots; many very fine and fine tubular pores; 35 percent channer; violently effervescent, 15 percent calcium carbonate equivalent; strongly alkaline, pH 8.8.

R—17 inches (43 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 30 to 40 percent channers

Particle-size control section clay content: 11 to 18 percent

A horizon

Hue: 5YR, 7.5YR

Value: 5 to 7 dry, 4 or 5 moist

Chroma: 2 to 6, dry or moist

Texture: sand, sandy loam

Clay: 2 to 18 percent

Calcium carbonate equivalent: 10 to 30 percent

Rock fragments: 20 to 30 percent channers

Reaction: strongly alkaline

Bw horizon

Hue: 5YR, 7.5YR

Value: 4 to 7 dry, 3 to 6 moist

Chroma: 2 to 6, dry or moist

Texture: sandy loam, fine sandy loam

Clay: 11 to 18 percent

Calcium carbonate equivalent: 10 to 30 percent

Rock fragments: 20 to 40 percent channers

Reaction: strongly alkaline

Cambic horizon: the zone from 2 to 17 inches (5 to 43 cm), (Bw horizon)

Leupp soils

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

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Geomorphic position: occurs on mesas and plateaus

Parent material: residuum weathered from calcareous sandstone

Slope: 2 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: 5 percent

-bare soil: 75 percent

rock fragments

channer: 50 percent

flagstone: 5 percent

Depth to restrictive feature(s): 4 to 12 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: 0.00 to 0.06 inches per hour (0.00 to 0.42 micrometers per second)

Available water capacity total inches: 1.1 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: medium

Hydrologic group: D

Ecological site name: Sandstone/Shale Upland 6-10" p.z.

Ecological site number: R035XB215AZ

Present vegetation: galleta, alkali sacaton, black grama, Bigelow sagebrush, blue grama, fourwing saltbush, bottlebrush squirreltail

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 24' 18.40" north, 111° 10' 27.30" west

A—0 to 3 inches (0 to 8 cm); light reddish brown (5YR 6/3) sandy clay loam, reddish brown (5YR 5/3), moist; 22 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; few very fine roots; few very fine vesicular pores; 10 percent channer; violently effervescent, 15 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

C—3 to 9 inches (8 to 23 cm); reddish brown (5YR 4/4) channery loam, dark reddish brown (5YR 3/4), moist; 18 percent clay; moderate fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine vesicular pores; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

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

Range in Characteristics

Rock fragments of the control section: 15 to 28 percent channers

Particle-size control section clay content: 18 to 28 percent

A horizon

Hue: 5YR
Value: 6 dry, 5 moist
Chroma: 3, dry or moist
Texture: sandy clay loam, sandy loam, loam
Clay: 18 to 28 percent
Calcium carbonate equivalent: 10 to 25 percent
Rock fragments: 5 to 15 percent channers
Reaction: moderately alkaline to strongly alkaline

C horizon

Hue: 5YR
Value: 4 dry, 3 moist
Chroma: 4, dry or moist
Texture: loam, sandy loam, sandy clay loam
Clay: 18 to 28 percent
Calcium carbonate equivalent: 10 to 25 percent
Rock fragments: 20 to 35 percent channers
Reaction: moderately alkaline to strongly alkaline

9—Gladel family-Arabrab complex, 4 to 35 percent slopes

Map Unit Setting

Landform(s): plateaus
Elevation: 7,000 to 7,100 feet (2,133 to 2,164 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (8.0 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (9.1 to 11.1 degrees C)
Frost-free period: 120 to 150 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-6 Colorado Plateau Pinyon-Juniper Sagebrush

Map Unit Composition

Gladel family and similar soils: 45 percent
Arabrab and similar soils: 30 percent
Minor Components: 25 percent
- Fine-loamy Aridic Haplustalfs
- Coarse-loamy Aridic Ustorthents
- Loamy Aridic Lithic Ustorthents
- Rock outcrop
- Soils that have lithic contact greater than 20 inches

Soil Properties and Qualities

Gladel family soils

Taxonomic classification: Loamy, mixed, superactive, mesic Aridic Lithic Haplustepts
Geomorphic position: occurs on structural benches and mesas
Parent material: alluvium derived from limestone and sandstone over residuum
weathered from limestone and sandstone
Slope: 15 to 35 percent
Surface cover:
Biological crust
-cyanobacteria: 0 percent
-lichen: 0 percent

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-moss: 0 percent
Chemical crust
-salt: 0 percent
-gypsum: 0 percent
Physical cover
-canopy plant cover: 35 percent
-woody debris: 5 percent
-bare soil: 60 percent
rock fragments
gravel: 50 percent
cobble: 5 percent
Depth to restrictive feature(s): 8 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 2.00 inches per hour (1.41 to 14.11 micrometers per second)
Available water capacity total inches: 1.1 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: high
Hydrologic group: B
Ecological site name: Pinus edulis-Juniperus osteosperma/Purshia stansburiana-Yucca baccata/Bouteloua curtipendula-Bouteloua gracilis
Ecological site number: F035XG714AZ
Present vegetation: banana yucca, Bigelow sage, black sagebrush, blue grama, cactus, *Ephedra*, pinyon, quininebush, Utah agave, Utah juniper, western wheatgrass, Wyoming big sagebrush
Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 35° 54' 57.00" north, 111° 40' 9.90" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) gravelly sandy loam, brown (7.5YR 4/3), moist; 18 percent clay; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine interstitial pores; 25 percent gravel and 5 percent cobble; slightly effervescent, 1 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; gradual smooth boundary.

Bk—2to 8 inches (5 to 20 cm); brown (7.5YR 5/4) gravelly loam, brown (7.5YR 4/3), moist; 18 percent clay; moderate fine and medium angular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine tubular pores; common carbonate masses in matrix; 20 percent gravel and 10 percent cobble; slightly effervescent, 13 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; gradual smooth boundary.

C—8 to 14 inches (20 to 36 cm); brown (7.5YR 4/3) stony sandy loam, brown (7.5YR 4/2), moist; 16 percent clay; massive; loose, slightly sticky, slightly plastic; common very fine and fine roots; common very fine interstitial pores; 5 percent gravel, 5 percent cobble, and 15 percent stone; strongly effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

R—14 inches (36 cm); unfractured, unweathered limestone bedrock.

Range in Characteristics

Gladel family differs from the series because it has up to 22 percent clay in the control section, lithic contact with limestone, and includes loam and sandy clay loam textures.

Rock fragments of the control section: 13 to 34 percent gravels, cobbles, and stones
Particle-size control section clay content: 13 to 22 percent

A horizon

Hue: 7.5YR, 5YR
Value: 3 to 5 dry, 3 or 4 moist
Chroma: 3 or 4, dry or moist
Texture: sandy loam, fine sandy loam
Clay: 12 to 19 percent
Calcium carbonate equivalent: 0 to 2 percent
Rock fragments: 12 to 34 percent gravels and cobbles
Reaction: slightly alkaline to moderately alkaline

Bk, C horizons

Hue: 7.5YR
Value: 4 to 5 dry, 3 or 4 moist
Chroma: 3 or 4, dry or moist
Texture: loam, sandy loam, sandy clay loam
Clay: 12 to 24 percent
Calcium carbonate equivalent: 10 to 15 percent
Rock fragments: 12 to 34 percent gravels, cobbles, and stones
Reaction: slightly alkaline to moderately alkaline

Cambic horizon: the zone from 2 to 8 inches (5 to 20 cm), (Bk horizon)

Some pedons have a Bw horizon.

Arabrab soils

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

Geomorphic position: occurs on structural benches and mesas

Parent material: alluvium derived from limestone and sandstone over residuum weathered from limestone and sandstone

Slope: 4 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: 60 percent
-woody debris: 5 percent
-bare soil: 35 percent
rock fragments
 gravel: 25 percent
 cobble: 3 percent
 flagstone: 2 percent

Depth to restrictive feature(s): 8 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)

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Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.41 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: low

Hydrologic group: B

Ecological site name: Loamy Upland 14-18" p.z.

Ecological site number: R035XG711AZ

Present vegetation: banana yucca, Bigelow sage, black sagebrush, blue grama, cactus, *Ephedra*, pinyon, quininebush, Utah agave, Utah juniper, western wheatgrass, Wyoming big sagebrush

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 35° 55' 3.30" north, 111° 40' 32.10" west

A—0 to 3 inches (0 to 8 cm); brown (7.5YR 5/4) gravelly sandy loam, brown (7.5YR 4/4), moist; 14 percent clay; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine vesicular pores; 15 percent gravel; slightly effervescent, 1 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; gradual smooth boundary.

Bt1—3 to 7 inches (8 to 18 cm); yellowish red (5YR 5/6) gravelly sandy clay loam, yellowish red (5YR 4/6), moist; 22 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common medium, many very fine and fine roots; common very fine and fine tubular pores; few clay films in root channels and/or pores; 15 percent gravel and 2 percent cobble; slightly effervescent, 5 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; gradual smooth boundary.

Bt2—7 to 13 inches (18 to 33 cm); yellowish red (5YR 5/6) gravelly sandy clay loam, yellowish red (5YR 5/6), moist; 25 percent clay; moderate fine subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few medium, common very fine and fine roots; common very fine and fine tubular pores; few clay films in root channels and/or pores; 15 percent gravel and 10 percent cobble; slightly effervescent, 5 percent calcium carbonate equivalent; slightly alkaline, pH 7.6.

R—13 inches (33 cm); unfractured, unweathered limestone bedrock.

Range in Characteristics

Rock fragments of the control section: 9 to 29 percent gravels and cobbles

Particle-size control section clay content: 18 to 26 percent

A horizon

Hue: 7.5YR, 5YR

Value: 3 to 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam

Clay: 12 to 18 percent

Calcium carbonate equivalent: 0 to 2 percent

Rock fragments: 5 to 25 percent gravels

Reaction: slightly alkaline to moderately alkaline

Bt horizon

Hue: 7.5YR, 5YR

Value: 4 or 5 dry, 3 to 6 moist
Chroma: 3 to 6, dry or moist
Texture: sandy clay loam, sandy loam
Clay: 18 to 28 percent
Calcium carbonate equivalent: 2 to 10 percent
Rock fragments: 10 to 34 percent gravels and cobbles
Reaction: slightly alkaline to moderately alkaline

Argillic horizon: the zone from 3 to 13 inches (8 to 33 cm), (Bt horizon)

10—Grieta extremely gravelly fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

Landform(s): lava plateaus
Elevation: 5,300 to 5,500 feet (1,616 to 1,676 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Grieta and similar soils: 80 percent
Minor Components: 20 percent
-Wupatki taxadjunct and similar soils
-Wukoki taxadjunct and similar soils
-Loamy-skeletal Typic Calciargids and similar soils
-Rock outcrop

Soil Properties and Qualities

Grieta soils

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Typic Calciargids
Geomorphic position: occurs on summits of basalt plateaus and mesas
Parent material: eolian deposits derived from sedimentary rock over colluvium derived from basalt
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: 10 percent
-bare soil: 70 percent
rock fragments
gravel: 75 percent

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cobble: 10 percent
stone: 1 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: 9.4 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: C
Ecological site name: Loamy Upland 6-10" p.z.
Ecological site number: R035XB210AZ
Present vegetation: galleta, black grama, *Sphaeralcea*, Indian ricegrass, alkali sacaton, bottlebrush squirreltail, blue grama, fourwing saltbush
Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 41' 8.28" north, 111° 35' 23.42" west

A—0 to 2 inches (0 to 5 cm); brown (10YR 5/3) extremely gravelly fine sandy loam, very dark grayish brown (10YR 3/2), moist; 10 percent clay; strong thick platy parts to strong thin platy structure; moderately hard, friable, slightly sticky, moderately plastic; many very fine and fine irregular and vesicular pores; 75 percent gravel and 3 percent cobble; noneffervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bt—2 to 12 inches (5 to 30 cm); brown (10YR 4/3) clay loam, dark yellowish brown (10YR 3/4), moist; 30 percent clay; strong medium subangular blocky parts to weak very thin platy structure; hard, friable, very sticky, very plastic; many very fine roots; few very fine irregular and tubular pores; many clay films on all faces of peds; noneffervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk1—12 to 28 inches (30 to 71 cm); light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2), moist; 28 percent clay; moderate medium subangular blocky structure; moderately hard, friable, slightly sticky, moderately plastic; many very fine irregular and tubular pores; common carbonate masses in matrix and many carbonate, finely disseminated; 4 percent gravel and 2 percent cobble; violently effervescent, 39 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

Bk2—28 to 37 inches (71 to 94 cm); very pale brown (10YR 8/2) silt loam, light brownish gray (10YR 6/2), moist; 22 percent clay; strong thin platy parts to strong fine subangular blocky structure; hard, firm, slightly sticky, slightly plastic; common very fine irregular pores; common carbonate, finely disseminated and many carbonate masses in matrix; 5 percent gravel and 5 percent cobble; violently effervescent, 58 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear wavy boundary.

Bk3—37 to 68 inches (94 to 173 cm); white (10YR 8/1) extremely cobbly silty clay loam, gray (10YR 6/1), moist; 28 percent clay; massive; moderately hard, friable, slightly sticky, slightly plastic; common carbonate, finely disseminated and many carbonate masses in matrix; 20 percent gravel and 50 percent cobble; violently effervescent, 43 percent calcium carbonate equivalent; strongly alkaline, pH 8.8.

Range in Characteristics

Rock fragments of the control section: 0 to 5 percent gravels

Particle-size control section clay content: 27 to 35 percent

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A horizon

Hue: 10YR
Value: 4 or 5 dry, 2.5 or 3 moist
Chroma: 3 or 4 dry, 2 to 4 moist
Texture: fine sandy loam
Clay: 7 to 12 percent
Rock fragments: 60 to 80 percent gravels and cobbles
Reaction: moderately alkaline

Bt horizon

Hue: 10YR
Value: 4 dry, 3 moist
Chroma: 3 or 4, dry or moist
Texture: clay loam
Clay: 27 to 35 percent
Rock fragments: 0 to 5 percent gravels
Reaction: moderately alkaline

Bk horizon

Hue: 10YR
Value: 6 to 8 dry, 4 or 6 moist
Chroma: 1 or 2, dry or moist
Texture: silty clay loam, silt loam
Clay: 18 to 35 percent
Calcium carbonate equivalent: 20 to 60 percent
Rock fragments: 0 to 80 percent gravels and cobbles
Reaction: strongly alkaline

Argillic horizon: the zone from 2 to 12 inches (5 to 30 cm), (Bt horizon)

Calcic horizon: the zone from 12 to 60 inches (30 to 173 cm), (Bk horizon)

11—Hajisho-Cataract family-Shinume complex, 4 to 15 percent slopes

Map Unit Setting

Landform(s): structural benches
Elevation: 3,140 to 5,660 feet (958 to 1,724 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Hajisho and similar soils: 35 percent
Cataract family and similar soils: 25 percent
Shinume and similar soils: 25 percent
Minor Components: 15 percent
-Typic Calcargids and similar soils
-Rock outcrop

Soil Properties and Qualities

Hajisho soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Lithic Haplocalcids

Geomorphic position: occurs on backslopes on structural benches

Parent material: colluvium derived from limestone over residuum weathered from limestone

Slope: 4 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: 5 percent

-bare soil: 70 percent

rock fragments

gravel: 75 percent

Depth to restrictive feature(s): 14 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: 0.00 to 0.06 inches per hour (0.00 to 0.42 micrometers per second)

Available water capacity total inches: 1.5 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: low

Hydrologic group: D

Ecological site name: Kaibab Formation Limestone/Sandstone Upland 6-10" p.z.

Ecological site number: R035XB232AZ

Present vegetation: blue grama, broom snakeweed, fourwing saltbush, globemallow, sand dropseed

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 27' 24.31" north, 111° 47' 6.04" west

A—0 to 3 inches (0 to 8 cm); strong brown (7.5YR 5/6) gravelly very fine sandy loam, strong brown (7.5YR 4/6), moist; 4 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common medium and very fine roots; common medium and fine irregular pores; 25 percent gravel; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk1—3 to 10 inches (8 to 25 cm); strong brown (7.5YR 5/6) very gravelly very fine sandy loam, strong brown (7.5YR 4/6), moist; 6 percent clay; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common medium and very fine roots; common very fine irregular pores; common carbonate masses in matrix and common carbonate concretions on bottom of rock

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fragments; 30 percent gravel, 10 percent cobble, and 5 percent channer; violently effervescent, 25 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

Bk2—10 to 17 inches (25 to 43 cm); reddish yellow (7.5YR 6/6) extremely gravelly very fine sandy loam, strong brown (7.5YR 5/6), moist; 6 percent clay; massive; loose, slightly sticky, slightly plastic; common very fine roots; common medium and very fine irregular pores; common carbonate, finely disseminated and common carbonate concretions on bottom of rock fragments; 70 percent gravel, 5 percent cobble, and 7 percent channer; violently effervescent, 25 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

R—17 inches (43 cm); unfractured, unweathered limestone bedrock.

Range in Characteristics

Rock fragments of the control section: 60 to 85 percent gravels, channers, and cobbles
Particle-size control section clay content: 4 to 18 percent

A horizon

Hue: 7.5YR
Value: 4 or 5 dry, 3 or 4 moist
Chroma: 6, dry or moist
Texture: very fine sandy loam, fine sandy loam
Clay: 4 to 16 percent
Calcium carbonate equivalent: 10 to 15 percent
Rock fragments: 20 to 35 percent gravels
Reaction: moderately alkaline to strongly alkaline

Bk horizon

Hue: 7.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 6, dry or moist
Texture: very fine sandy loam, fine sandy loam
Clay: 4 to 18 percent
Calcium carbonate equivalent: 15 to 30 percent
Rock fragments: 30 to 85 percent gravels, channers, and cobbles
Reaction: moderately alkaline to strongly alkaline

Calcic horizon: the zone from 3 to 17 inches (8 to 43 cm), (Bk horizon)

Cataract family soils

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Typic Calciargids

Geomorphic position: occurs on footslopes of structural benches

Parent material: slope alluvium derived from limestone and sandstone over residuum weathered from limestone and sandstone

Slope: 4 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: 10 percent

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-bare soil: 50 percent
rock fragments
gravel: 80 percent
Depth to restrictive feature(s): 22 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 1.41 micrometers per second)
Available water capacity total inches: 2.9 (low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: low
Hydrologic group: C
Ecological site name: Kaibab Formation Limestone/Sandstone Upland 6-10" p.z.
Ecological site number: R035XB232AZ
Present vegetation: shadscale saltbush, *Ephedra*, pricklypear, broom snakeweed, galleta, fluffgrass
Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 48' 0.50" north, 111° 36' 49.00" west

A—0 to 1 inch (0 to 3 cm); brown (7.5YR 5/4) extremely gravelly fine sandy loam, dark brown (7.5YR 3/4), moist; 4 percent clay; moderate fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine irregular pores; 70 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bt—1 inch to 4 inches (3 to 10 cm); brown (7.5YR 4/4) loam, dark brown (7.5YR 3/4), moist; 22 percent clay; weak fine subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; common very fine roots; common very fine irregular pores; very few clay films on all faces of peds; 10 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Btk1—4 to 9 inches (10 to 23 cm); brown (7.5YR 5/4) gravelly clay loam, strong brown (7.5YR 4/6), moist; 30 percent clay; moderate coarse subangular blocky structure; moderately hard, friable, very sticky, moderately plastic; common medium and very fine roots; common very fine irregular pores; few clay films on all faces of peds; common carbonate masses in matrix; 15 percent gravel; violently effervescent, 25 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear wavy boundary.

Btk2—9 to 15 inches (23 to 38 cm); strong brown (7.5YR 5/6) gravelly clay loam, red (7.5R 4/6), moist; 30 percent clay; moderate very coarse subangular blocky structure; moderately hard, firm, very sticky, moderately plastic; common medium and very fine roots; common very fine irregular pores; few clay films on all faces of peds; common carbonate masses in matrix; 20 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual wavy boundary.

C—15 to 39 inches (38 to 99 cm); white (7.5YR 8/1) very gravelly loamy sand, pale yellow (2.5Y 7/4), moist; 4 percent clay; massive; moderately hard, friable, nonsticky, nonplastic; common very fine roots; common very fine irregular pores; 50 percent gravel; slightly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; abrupt smooth boundary.

R—39 inches (99 cm); unfractured, unweathered limestone bedrock.

Range in Characteristics

Cataract family differs from the series because it has up to 22 percent gravels in the particle size control section, very gravely substratum, and hues of 7.5YR.

Rock fragments of the control section: 14 to 22 percent gravels

Particle-size control section clay content: 18 to 28 percent

A horizon

Hue: 7.5YR
Value: 5 dry, 3 moist
Chroma: 4, dry or moist
Texture: fine sandy loam
Clay: 4 to 12 percent
Calcium carbonate equivalent: 10 to 15 percent
Rock fragments: 40 to 70 percent gravels
Reaction: moderately alkaline

Bt horizon

Hue: 7.5YR
Value: 4 dry, 3 moist
Chroma: 4, dry or moist
Texture: loam, sandy loam
Clay: 12 to 24 percent
Calcium carbonate equivalent: 10 to 15 percent
Rock fragments: 10 to 20 percent gravels
Reaction: moderately alkaline

Btk horizon

Hue: 7.5YR
Value: 5 dry, 4 moist
Chroma: 4 to 6, dry or moist
Texture: clay loam, loam
Clay: 20 to 30 percent
Calcium carbonate equivalent: 15 to 30 percent gravels
Rock fragments: 10 to 20 percent
Reaction: moderately alkaline to strongly alkaline

C horizon

Hue: 7.5YR, 2.5Y
Value: 8 dry, 7 moist
Chroma: 1 dry, 4 moist
Texture: loamy sand, loamy fine sand, sandy loam
Clay: 4 to 12 percent
Calcium carbonate equivalent: 2 to 10 percent
Rock fragments: 45 to 60 percent gravels
Reaction: moderately alkaline

Argillic horizon: the zone from 1 to 15 inches (3 to 38 cm), (Bt, Btk horizons)

Calcic horizon: the zone from 4 to 15 inches (10 to 38 cm), (Btk horizon)

Shinume soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Torriorthents

Geomorphic position: occurs on shoulders of structural benches

Parent material: colluvium derived from limestone and sandstone over residuum weathered from limestone and sandstone

Slope: 4 to 15 percent

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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: 0 percent
- bare soil: 70 percent
- rock fragments
- channer: 20 percent
- flagstone: 20 percent

Depth to restrictive feature(s): 14 to 20 inches to bedrock, lithic

Drainage class: excessively 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 0.06 inches per hour (0.00 to 0.42 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: low

Hydrologic group: D

Ecological site name: Kaibab Formation Limestone/Sandstone Upland 6-10" p.z.

Ecological site number: R035XB232AZ

Present vegetation: shadscale saltbush, *Ephedra*, pricklypear, broom snakeweed, galleta, fluffgrass

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 50' 30.69" north, 111° 36' 47.54" west

A—0 to 1 inch (0 to 3 cm); light brown (7.5YR 6/4) very flaggy loamy fine sand, brown (7.5YR 5/4), moist; 2 percent clay; weak very fine platy structure; soft, very friable, nonsticky, nonplastic; common very fine roots; many very fine tubular pores; 20 percent channer and 20 percent flagstone; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

C1—1 inch to 11 inches (3 to 28 cm); pink (7.5YR 7/3) very channery loamy very fine sand, light brown (7.5YR 6/3), moist; 2 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; common very fine roots; few very fine and fine tubular pores; 45 percent channer; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

C2—11 to 17 inches (28 to 43 cm); very pale brown (10YR 7/3) very channery fine sandy loam, pale brown (10YR 6/3), moist; 4 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; common very fine roots; common fine tubular pores; 45 percent channer; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; very abrupt smooth boundary.

R—17 inches (43 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 35 to 50 percent channers
Particle-size control section clay content: 2 to 18 percent

A horizon

Hue: 5YR, 7.5YR
Value: 4 to 6, dry or moist
Chroma: 4, dry or moist
Texture: loamy fine sand, loamy sand
Clay: 2 to 10 percent
Calcium carbonate equivalent: 5 to 15 percent
Rock fragments: 35 to 50 percent channers and flagstones
Reaction: moderately alkaline to strongly alkaline

C horizon

Hue: 5YR, 7.5YR, 10YR
Value: 6 or 7 dry, 5 or 6 moist
Chroma: 3 or 4, dry or moist
Texture: loamy very fine sand, fine sandy loam, very fine sandy loam
Clay: 2 to 18 percent
Calcium carbonate equivalent: 5 to 15 percent
Rock fragments: 35 to 50 percent channers
Reaction: moderately alkaline to strongly alkaline

12—Hajisho-Seeg complex, 2 to 15 percent slopes

Map Unit Setting

Landform(s): plateaus
Elevation: 5,000 to 5,300 feet (1,524 to 1,616 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Hajisho and similar soils: 55 percent
Seeg and similar soils: 25 percent
Minor Components: 20 percent
-Tsaya and similar soils
-Cataract and similar soils
-Rock outcrop

Soil Properties and Qualities

Hajisho soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Lithic Haplocalcids
Geomorphic position: occurs on summits on plateaus
Parent material: colluvium derived from limestone over residuum weathered from limestone
Slope: 2 to 15 percent

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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
- rock fragments
 - gravel: 60 percent
 - cobble: 2 percent
 - channer: 5 percent
 - flagstone: 3 percent

Depth to restrictive feature(s): 12 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 0.20 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 high

Hydrologic group: D

Ecological site name: Kaibab Formation Limestone/Sandstone Upland 6-10" p.z.

Ecological site number: R035XB232AZ

Present vegetation: fourwing saltbush, *Ephedra*, galleta, Douglas rabbitbrush, blue grama, burrograss

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 46' 22.08" north, 111° 34' 12.48" west

C—0 to 1 inch (0 to 3 cm); brown (7.5YR 5/4) fine sandy loam, strong brown (7.5YR 4/6), moist; 6 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; many very fine irregular pores; 12 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bk1—1 inch to 5 inches (3 to 13 cm); brown (7.5YR 5/4) very cobbly fine sandy loam, strong brown (7.5YR 4/6), moist; 8 percent clay; weak very fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine roots; many very fine irregular pores; common carbonate masses in matrix, carbonate concretions on bottom of rock fragments and carbonate, finely disseminated; 10 percent gravel and 25 percent cobble; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual wavy boundary.

Bk2—5 to 14 inches (13 to 36 cm); pinkish white (7.5YR 8/2) very flaggy silt loam, pink (7.5YR 7/3), moist; 6 percent clay; strong very fine and fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few medium and coarse and common very fine roots; few very fine vesicular and many very fine tubular

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pores; common carbonate masses in matrix and many carbonate concretions on bottom of rock fragments and common carbonate, finely disseminated; 25 percent gravel and 15 percent flagstone; violently effervescent, 35 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

R—14 inches (36 cm); unfractured, unweathered limestone bedrock.

Range in Characteristics

Rock fragments of the control section: 35 to 52 percent gravels, cobbles, and flagstones

Particle-size control section clay content: 5 to 8 percent

C horizon

Hue: 7.5YR

Value: 5 dry, 4 moist

Chroma: 4 or 6, dry or moist

Texture: fine sandy loam

Clay: 3 to 7 percent

Calcium carbonate equivalent: 10 to 15 percent

Rock fragments: 5 to 15 percent gravels

Reaction: moderately alkaline

Bk horizon

Hue: 7.5YR

Value: 5 to 8 dry, 4 to 7 moist

Chroma: 2 to 4 dry, 3 to 6 moist

Texture: fine sandy loam, silt loam

Clay: 5 to 8 percent

Calcium carbonate equivalent: 10 to 35 percent

Rock fragments: 35 to 55 percent gravels, cobbles, and flagstones

Reaction: moderately alkaline to strongly alkaline

Calcic horizon: the zone from 5 to 14 inches (13 to 36 cm), (Bk2 horizon)

Seeg soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Typic Haplocalcids

Geomorphic position: occurs on backslopes on plateaus

Parent material: slope alluvium derived from limestone over colluvium derived from limestone

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: 55 percent

-woody debris: 0 percent

-bare soil: 45 percent

rock fragments

gravel: 60 percent

Drainage class: well drained

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Ksat solum: 0.57 to 19.98 inches per hour (4.00 to 141.00 micrometers per second)

Available water capacity total inches: 3.7 (low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: low

Hydrologic group: B

Ecological site name: Sandy Loam Upland 6-10" p.z. Limy, Gravelly

Ecological site number: R035XB267AZ

Present vegetation: Indian ricegrass, shadscale saltbush, galleta, bottlebrush
squirreltail, sand dropseed

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 47' 26.64" north, 111° 33' 16.26" west

A—0 to 1 inch (0 to 3 cm); strong brown (7.5YR 5/6) very gravelly fine sandy loam, strong brown (7.5YR 4/6), moist; 5 percent clay; strong medium platy structure; soft, very friable, nonsticky, nonplastic; few medium and common very fine and fine roots; few very fine tubular pores; 40 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw—1 inch to 10 inches (3 to 25 cm); strong brown (7.5YR 5/6) very fine sandy loam, strong brown (7.5YR 4/6), moist; 10 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few medium and common very fine and fine roots; common very fine and fine tubular pores; 5 percent gravel and 2 percent cobble; violently effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

Bk—10 to 20 inches (25 to 51 cm); pink (7.5YR 7/3) extremely gravelly very fine sandy loam, strong brown (7.5YR 4/6), moist; 10 percent clay; moderate coarse and very coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine and fine tubular pores; many carbonate, finely disseminated and many carbonate concretions on bottom of rock fragments; 50 percent gravel and 15 percent cobble; violently effervescent, 35 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt wavy boundary.

C—20 to 60 inches (51 to 152 cm); brown (7.5YR 5/4) extremely cobbly loamy coarse sand, strong brown (7.5YR 4/6), moist; 3 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine to medium roots; many very fine irregular pores; 40 percent gravel, 25 percent cobble, 10 percent stone, and 5 percent boulder; violently effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

Range in Characteristics

Rock fragments of the control section: 38 to 82 percent gravels, cobbles, stones and boulders

Particle-size control section clay content: 4 to 8 percent

A horizon

Hue: 7.5YR

Value: 5 dry, 4 moist

Chroma: 6, dry or moist

Texture: fine sandy loam

Clay: 4 to 7 percent

Calcium carbonate equivalent: 5 to 15 percent

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Rock fragments: 35 to 45 percent gravels

Reaction: moderately alkaline

Bw horizon

Hue: 7.5YR

Value: 5 dry, 4 moist

Chroma: 6, dry or moist

Texture: very fine sandy loam, sandy loam

Clay: 7 to 12 percent

Calcium carbonate equivalent: 5 to 15 percent

Rock fragments: 0 to 15 percent gravels and cobbles

Reaction: moderately alkaline

Bk horizon

Hue: 7.5YR

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 3 or 4 dry, 4 or 6 moist

Texture: very fine sandy loam, sandy loam

Clay: 7 to 12 percent

Calcium carbonate equivalent: 15 to 35 percent

Rock fragments: 35 to 85 percent gravels and cobbles

Reaction: moderately alkaline to strongly alkaline

C horizon

Hue: 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 or 6, dry or moist

Texture: loamy coarse sand, loamy sand, sandy loam

Clay: 3 to 6 percent

Calcium carbonate equivalent: 5 to 15 percent

Rock fragments: 40 to 80 percent gravels, cobbles, stones, and boulders

Reaction: moderately alkaline

Calcic horizon: the zone from 10 to 20 inches (25 to 51 cm), (Bk horizon)

13—Hajisho-Seeg complex, 15 to 35 percent slopes

Map Unit Setting

Landform(s): plateaus

Elevation: 4,600 to 6,000 feet (1,402 to 1,829 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Hajisho and similar soils: 65 percent

Seeg and similar soils: 20 percent

Minor Components: 15 percent

-Rock outcrop

-Cataract and similar soils

-Tsaya and similar soils

Soil Properties and Qualities

Hajisho soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Lithic Haplocalcids

Geomorphic position: occurs on summits and shoulders on plateaus

Parent material: colluvium derived from limestone over residuum weathered from limestone

Slope: 15 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: 30 percent

-woody debris: 10 percent

-bare soil: 60 percent

rock fragments

gravel: 60 percent

Depth to restrictive feature(s): 8 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: 0.00 to 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 1.1 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: low

Hydrologic group: D

Ecological site name: Kaibab Formation Limestone/Sandstone Upland 6-10" p.z.

Ecological site number: R035XB232AZ

Present vegetation: fourwing saltbush, *Ephedra*, galleta, Douglas rabbitbrush, blue grama, burrograss

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 34' 5.67" north, 111° 43' 40.12" west

A—0 to 2 inches (0 to 5 cm); reddish yellow (7.5YR 6/6) very gravelly very fine sandy loam, strong brown (7.5YR 4/6), moist; 5 percent clay; moderate medium platy structure; somewhat hard, very friable; common very fine roots; common very fine irregular and tubular pores; common carbonate masses in matrix; 40 percent gravel; violently effervescent, 18 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk1—2 to 6 inches (5 to 15 cm); reddish yellow (7.5YR 6/6) very gravelly loam, strong brown (7.5YR 5/6), moist; 10 percent clay; moderate medium subangular blocky structure; slightly hard, very friable; common very fine roots; common very fine vesicular and tubular pores; many carbonate masses in matrix; 45 percent gravel and

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10 percent cobble; violently effervescent, 21 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear wavy boundary.

Bk₂—6 to 12 inches (15 to 31 cm); pink (7.5YR 7/4) extremely cobbly silt loam, light brown (7.5YR 6/4), moist; 7 percent clay; massive; loose, very friable; common very fine roots; common very fine irregular pores; many carbonate masses in matrix; 30 percent gravel and 50 percent cobble; violently effervescent, 40 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt smooth boundary.

R—12 inches (31cm); unfractured, unweathered limestone bedrock.

Range in Characteristics

Rock fragments of the control section: 45 to 70 percent gravels and cobbles
Particle-size control section clay content: 5 to 11 percent

A horizon

Hue: 7.5YR, 10YR
Value: 4 or 6 dry, 3 or 4 moist
Chroma: 4 or 6, dry or moist
Texture: very fine sandy loam, fine sandy loam
Clay: 3 to 8 percent
Calcium carbonate equivalent: 10 to 25 percent
Rock fragments: 35 to 50 percent gravels
Reaction: moderately alkaline to strongly alkaline

Bk horizon

Hue: 7.5YR, 10YR
Value: 6 or 7 dry, 5 or 6 moist
Chroma: 4 or 6, dry or moist
Texture: loam, fine sandy loam, very fine sandy loam, silt loam
Clay: 5 to 12 percent
Calcium carbonate equivalent: 15 to 40 percent
Rock fragments: 35 to 85 percent gravels and cobbles
Reaction: strongly alkaline

Calcic horizon: the zone from 2 to 12 inches (5 to 31 cm), (Bk horizon)

Seeg soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Typic Haplocalcids

Geomorphic position: occurs on footslopes and backslopes of plateaus

Parent material: colluvium derived from limestone over residuum weathered from limestone

Slope: 15 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: 30 percent
-woody debris: 10 percent
-bare soil: 60 percent
rock fragments

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gravel: 15 percent

cobble: 10 percent

Drainage class: somewhat excessively drained

Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

Available water capacity total inches: 3.9 (low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: very low

Hydrologic group: B

Ecological site name: Kaibab Formation Limestone/Sandstone Upland 6-10" p.z.

Ecological site number: R035XB232AZ

Present vegetation: fourwing saltbush, *Ephedra*, galleta, Douglas rabbitbrush, blue grama, burrograss

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 38' 45.80" north, 111° 42' 49.00" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) gravelly fine sandy loam, brown (7.5YR 4/4), moist; 5 percent clay; weak fine platy structure; soft, very friable, nonsticky, nonplastic; common very fine roots; common fine interstitial pores; 30 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bk1—2 to 9 inches (5 to 23 cm); brown (7.5YR 5/4) gravelly fine sandy loam, brown (7.5YR 4/4), moist; 7 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common coarse and very fine roots; common very fine interstitial pores; common carbonate masses in matrix and common carbonate concretions on bottom of rock fragments; 25 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear wavy boundary.

Bk2—9 to 22 inches (23 to 56 cm); pinkish white (7.5YR 8/2) very gravelly silt loam, light brown (7.5YR 6/3), moist; 11 percent clay; moderate medium subangular blocky structure; extremely hard, slightly firm, moderately sticky, moderately plastic; common medium and fine roots; common medium and fine irregular pores; common carbonate masses in matrix and common carbonate concretions on bottom of rock fragments; 35 percent gravel; violently effervescent, 25 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

C—22 to 60 inches (56 to 152 cm); very pale brown (10YR 8/2) very gravelly loamy sand, pale brown (10YR 6/3), moist; 3 percent clay; massive; very hard, extremely firm, nonsticky, nonplastic; common coarse and very fine roots; common very fine interstitial pores; 35 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

Range in Characteristics

Rock fragments of the control section: 35 to 45 percent gravels

Particle-size control section clay content: 4 to 10 percent

A horizon

Hue: 7.5YR, 10YR

Value: 5 dry, 4 moist

Chroma: 4, dry or moist

Texture: fine sandy loam, sandy loam

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Clay: 2 to 10 percent
Calcium carbonate equivalent: 10 to 15 percent
Rock fragments: 25 to 40 percent gravels
Reaction: moderately alkaline

Bk horizon

Hue: 7.5YR, 10YR
Value: 5 to 8 dry, 4 to 6 moist
Chroma: 2 to 4 dry, 3 or 4 moist
Texture: fine sandy loam, silt loam, loam
Clay: 6 to 16 percent
Calcium carbonate equivalent: 15 to 30 percent
Rock fragments: 35 to 45 percent gravels
Reaction: moderately alkaline to strongly alkaline

C horizon

Hue: 7.5YR, 10YR
Value: 8 dry, 6 moist
Chroma: 2 or 3, dry or moist
Texture: loamy sand, fine sandy loam
Clay: 2 to 6 percent
Calcium carbonate equivalent: 10 to 15 percent
Rock fragments: 35 to 45 percent gravels
Reaction: moderately alkaline

Calcic horizon: the zone from 2 to 22 inches (5 to 56 cm), (Bk horizon)

14—Hatknoll-Lithic Haplargids complex, 2 to 8 percent slopes

Map Unit Setting

Landform(s): structural benches
Elevation: 4,890 to 5,180 feet (1,492 to 1,580 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Hatknoll and similar soils: 65 percent
Lithic Haplargids and similar soils: 20 percent
Minor Components: 15 percent
-Typic Haplocalcids and similar soils
-Lithic Torriorthents and similar soils
-Rock outcrop

Soil Properties and Qualities

Hatknoll soils

Taxonomic classification: Fine, mixed, superactive, mesic Typic Calciargids
Geomorphic position: occurs on structural benches
Parent material: Shinarump Conglomerate member alluvium
Slope: 2 to 8 percent

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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

rock fragments

- gravel: 5 percent

Drainage class: well drained

Ksat solum: 0.06 to 1.98 inches per hour (0.42 to 14.00 micrometers per second)

Available water capacity total inches: 8.3 (high)

Shrink-swell potential: about 7.5 LEP (high)

Flooding hazard: none

Runoff class: low

Hydrologic group: C

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

Ecological site number: R035XB210AZ

Present vegetation: Forb, annual, galleta, Indian ricegrass, mustard, winterfat

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 5' 47.60" north, 111° 31' 32.40" west

A—0 to 2 inches (0 to 5 cm); reddish brown (5YR 5/4) sandy clay loam, dark reddish brown (5YR 3/4), moist; 30 percent clay; moderate medium subangular blocky parts to moderate medium platy structure; moderately hard, friable, moderately sticky, slightly plastic; few very fine roots; many very fine irregular and very fine vesicular pores; 1 percent gravel; noneffervescent; moderately alkaline, pH 8.0; very abrupt wavy boundary.

Bt—2 to 8 inches (5 to 20 cm); reddish brown (2.5YR 4/4) clay, dark red (2.5YR 3/6), moist; 55 percent clay; moderate medium and coarse subangular blocky structure; moderately hard, very friable, very sticky, moderately plastic; few very fine and fine roots; few very fine and fine tubular and many very fine irregular pores; few clay bridges between sand grains and common clay films on all faces of peds; 3 percent gravel; noneffervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Btk1—8 to 24 inches (20 to 61 cm); reddish brown (2.5YR 4/4) sandy clay loam, dark red (2.5YR 3/6), moist; 34 percent clay; moderate coarse subangular blocky structure; moderately hard, very friable, very sticky, moderately plastic; few very fine roots; many very fine irregular and tubular and few fine tubular pores; common clay films on all faces of peds and few clay bridges between sand grains; many carbonate masses in matrix; 10 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Btk2—24 to 34 inches (61 to 86 cm); red (2.5YR 4/6) sandy clay, dark red (2.5YR 3/6), moist; 47 percent clay; massive; hard, friable, very sticky, moderately plastic; few very fine roots; few very fine and fine irregular pores; common clay films on surfaces along root channels and few clay bridges between sand grains; common carbonate masses

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in matrix and common carbonate concretions on bottom of rock fragments; 5 percent gravel; strongly effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual smooth boundary.

Btk3—34 to 60 inches (86 to 152 cm); reddish brown (2.5YR 5/4) sandy clay, dark red (2.5YR 3/6), moist; 36 percent clay; massive; very hard, firm, moderately sticky, moderately plastic; few very fine roots; many very fine irregular and few very fine tubular pores; few clay bridges between sand grains and common clay films on surfaces along root channels; few carbonate concretions on bottom of rock fragments and many carbonate masses in matrix; 5 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

Range in Characteristics

Hatknoll, as used in this survey, is a taxadjunct to the series because it has mixed mineralogy and is formed from sandstone of the Chinle formation. Hatknoll is a fine, smectitic, mesic Typic Calciargids.

Rock fragments of the control section: 0 to 5 percent gravels
Particle-size control section clay content: 35 to 55 percent

A horizon

Hue: 5YR
Value: 5 dry, 3 moist
Chroma: 4, dry or moist
Texture: sandy clay loam, clay loam, loam
Clay: 25 to 35 percent
Rock fragments: 0 to 5 percent gravels
Reaction: moderately alkaline

Bt horizon

Hue: 2.5YR
Value: 4 dry, 3 moist
Chroma: 4 or 6, dry or moist
Texture: clay, sandy clay loam, clay loam, sandy clay
Clay: 30 to 55 percent
Rock fragments: 0 to 5 percent gravels
Reaction: moderately alkaline

Btk horizon

Hue: 2.5YR, 5YR
Value: 4 to 7 dry, 3 or 4 moist
Chroma: 4 or 6, dry or moist
Texture: sandy clay, clay, sandy clay loam, clay loam
Clay: 30 to 50 percent
Calcium carbonate equivalent: 15 to 30 percent
Rock fragments: 0 to 10 percent gravels
Reaction: moderately alkaline to strongly alkaline

Argillic horizon: the zone from 2 to 60 inches (5 to 152 cm), (Bt, Btk horizons)

Calcic horizon: the zone from 8 to 60 inches (2 to 152 cm), (Btk horizon)

Lithic Haplargids soils

Taxonomic classification: Clayey, mixed, superactive, mesic Lithic Haplargids

Geomorphic position: occurs on structural benches

Parent material: Shinarump Conglomerate member alluvium over residuum weathered from sandstone

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Slope: 2 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: 10 percent

-bare soil: 70 percent

rock fragments

gravel: 5 percent

cobble: 5 percent

channer: 20 percent

Depth to restrictive feature(s): 4 to 10 inches to bedrock, lithic

Drainage class: 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: 1.0 (very low)

Shrink-swell potential: about 7.5 LEP (high)

Flooding hazard: none

Runoff class: medium

Hydrologic group: D

Ecological site name: Shallow Loamy 6-10" p.z. Calcareous

Ecological site number: R035XB226AZ

Present vegetation: blackbrush, *Ephedra*, shadscale saltbush, porcupine pricklypear, galleta

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 0' 51.00" north, 111° 31' 5.00" west

A—0 to 1 inch (0 to 2 cm); reddish brown (2.5YR 5/4) sandy clay, reddish brown (2.5YR 4/4), moist; 36 percent clay; moderate very thick platy structure; moderately hard, friable, moderately sticky, moderately plastic; common very fine roots; common very fine vesicular and many very fine irregular pores; 5 percent gravel; violently effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bt—1 inch to 3 inches (2 to 8 cm); red (2.5YR 4/6) sandy clay, reddish brown (2.5YR 4/4), moist; 45 percent clay; weak coarse and very coarse subangular blocky parts to weak very fine subangular blocky structure; slightly hard, very friable, very sticky, very plastic; few very fine roots; few very fine irregular pores; common clay bridges between sand grains; 5 percent gravel; violently effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Btk—3 to 7 inches (8 to 18 cm); reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/3), moist; 54 percent clay; moderate fine and medium subangular blocky structure; hard, very friable, very sticky, very plastic; few very fine roots; many very fine irregular and few fine and medium tubular pores; common clay films on all faces

of peds; common carbonate masses in matrix; 5 percent gravel; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

R—7 inches (18 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Lithic Haplargids describes a soil that has not been established. There are no existing series.

Rock fragments of the control section: 0 to 10 percent gravels

Particle-size control section clay content: 34 to 44 percent

A horizon

Hue: 2.5YR, 5YR

Value: 5 to 6 dry, 4 or 5 moist

Chroma: 4 or 6, dry or moist

Texture: sandy clay, clay, sandy clay loam, clay loam

Clay: 30 to 40 percent

Calcium carbonate equivalent: 10 to 15 percent

Rock fragments: 0 to 10 percent

Reaction: moderately alkaline

Bt horizon

Hue: 2.5YR, 5YR

Value: 4 or 5 dry, 4 to 6 moist

Chroma: 4 or 6, dry or moist

Texture: sandy clay, clay

Clay: 40 to 60 percent

Calcium carbonate equivalent: 10 to 15 percent

Rock fragments: 0 to 10 percent gravels

Reaction: moderately alkaline

Btk horizon

Hue: 2.5YR, 5YR

Value: 3 to 6 dry or moist

Chroma: 3 or 4, dry or moist

Texture: clay, sandy clay, sandy clay loam, clay loam

Clay: 30 to 60 percent

Calcium carbonate equivalent: 10 to 15 percent

Rock fragments: 0 to 10 percent gravels

Reaction: moderately alkaline

Argillic horizon: the zone from 1 inch to 7 inches (2 to 18 cm), (Bt and Btk horizons)

15—Hoskinnini-Moenkopie complex, 2 to 8 percent slopes

Map Unit Setting

Landform(s): structural benches

Elevation: 4,920 to 5,350 feet (1,500 to 1,630 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

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

Map Unit Composition

Hoskinnini and similar soils: 45 percent
Moenkopie and similar soils: 40 percent
Minor Components: 15 percent
-Typic Torriothents and similar soils
-Typic Haplargids and similar soils

Soil Properties and Qualities

Hoskinnini soils

Taxonomic classification: Loamy, mixed, superactive, mesic Lithic Haplargids

Geomorphic position: occurs on footslopes on structural benches

Parent material: alluvium over Moenkopie formation residuum weathered from calcareous sandstone

Slope: 2 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: 70 percent
 - woody debris: 0 percent
 - bare soil: 30 percent
- rock fragments
- gravel: 15 percent
 - channer: 5 percent
 - flagstone: 5 percent

Depth to restrictive feature(s): 10 to 18 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: 0.20 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: very high

Hydrologic group: D

Ecological site name: Shallow Loamy 6-10" p.z. Calcareous

Ecological site number: R035XB226AZ

Present vegetation: blackbrush, galleta, Indian ricegrass

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 12' 8.00" north, 111° 33' 52.00" west

A—0 to 1 inch (0 to 3 cm); reddish brown (5YR 5/4) fine sandy loam, dark reddish brown (5YR 3/4), moist; 10 percent clay; moderate fine subangular blocky structure;

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slightly hard, very friable, nonsticky, nonplastic; few very fine roots; common fine interstitial pores; 10 percent gravel; noneffervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bw—1 inch to 3 inches (3 to 8 cm); dark reddish brown (2.5YR 3/4) loam, dark reddish brown (2.5YR 3/3), moist; 15 percent clay; weak coarse subangular blocky parts to strong very fine angular blocky structure; soft, very friable, slightly sticky, nonplastic; common very fine and fine roots; many very fine interstitial pores; 5 percent gravel; noneffervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Bt1—3 to 8 inches (8 to 20 cm); dark reddish brown (2.5YR 3/4) gravelly silty clay loam, dark reddish brown (2.5YR 3/3), moist; 30 percent clay; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; common fine interstitial pores; few clay films on all faces of peds; 20 percent gravel; slightly effervescent, 5 percent calcium carbonate equivalent; strongly alkaline, pH 8.5; clear wavy boundary.

Bt2—8 to 13 inches (20 to 33 cm); dark reddish brown (2.5YR 3/4) gravelly silty clay loam, dark reddish brown (2.5YR 3/3), moist; 35 percent clay; moderate medium subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common fine tubular pores; common clay films on all faces of peds; 30 percent gravel; slightly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

R—13 inches (33 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 20 to 30 percent gravels

Particle-size control section clay content: 28 to 35 percent

A horizon

Hue: 5YR, 2.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, loamy sand, loam, fine sandy loam

Clay: 5 to 15 percent

Rock fragments: 5 to 15 percent gravels

Reaction: moderately alkaline

Bw horizon

Hue: 2.5YR, 5YR

Value: 3 to 5, dry or moist

Chroma: 3 or 4, dry or moist

Texture: loam, sandy loam

Clay: 10 to 20 percent

Rock fragments: 0 to 10 percent gravels

Reaction: moderately alkaline

Bt horizon

Hue: 2.5YR, 5YR

Value: 3 to 5, dry or moist

Chroma: 3 or 4, dry or moist

Texture: silty clay loam, sandy clay loam, clay loam

Clay: 25 to 40 percent

Calcium carbonate equivalent: 2 to 5 percent

Rock fragments: 15 to 35 percent gravels

Reaction: moderately alkaline to strongly alkaline

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Argillic horizon: the zone from 3 to 13 inches (8 to 33 cm), (Bt horizon)

Moenkopie soils

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

Geomorphic position: occurs on backslopes on structural benches

Parent material: colluvium over Moenkopie formation residuum weathered from calcareous sandstone

Slope: 2 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: 70 percent

-woody debris: 0 percent

-bare soil: 30 percent

rock fragments

boulder: 2 percent

channer: 45 percent

flagstone: 15 percent

Depth to restrictive feature(s): 4 to 10 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: 0.7 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very high

Hydrologic group: D

Ecological site name: Shallow Loamy 6-10" p.z. Calcareous

Ecological site number: R035XB226AZ

Present vegetation: blackbrush, galleta, Indian ricegrass

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 9' 13.00" north, 111° 34' 5.00" west

A—0 to 2 inches (0 to 5 cm); reddish brown (2.5YR 4/4) loam, dark reddish brown (2.5YR 3/4), moist; 17 percent clay; moderate thick platy structure; soft, very friable, moderately sticky, slightly plastic; few very fine and fine roots; many very fine vesicular pores; 10 percent channer; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C1—2 to 6 inches (5 to 15 cm); reddish brown (5YR 4/4) flaggy sandy loam, reddish brown (5YR 4/3), moist; 13 percent clay; moderate medium subangular blocky parts to weak very fine subangular blocky structure; loose, slightly sticky, slightly plastic; few very fine and fine roots; common very fine vesicular pores; 15 percent channer and

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15 percent flagstone; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—6 to 8 inches (15 to 20 cm); reddish brown (5YR 4/4) very flaggy sandy loam, reddish brown (5YR 4/3), moist; 13 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few medium roots; common very fine vesicular pores; 25 percent channer and 20 percent flagstone; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

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

Range in Characteristics

Rock fragments of the control section: 20 to 30 percent channers and flagstones

Particle-size control section clay content: 9 to 18 percent

A horizon

Hue: 2.5YR, 5YR

Value: 3 to 5 dry, 3 or 4 moist

Chroma: 4 or 5, dry or moist

Texture: loam, sandy loam

Clay: 12 to 20 percent

Calcium carbonate equivalent: 10 to 25 percent

Rock fragments: 5 to 15 percent channers

Reaction: moderately alkaline

C horizon

Hue: 5YR, 2.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, loam, loamy sand

Clay: 8 to 18 percent

Calcium carbonate equivalent: 10 to 25 percent

Rock fragments: 20 to 45 percent channers, and flagstones

Reaction: moderately alkaline

16—Ives-Bebeever family-Oxyaquic Torripsamments complex, 0 to 3 percent slopes

Map Unit Setting

Landform(s): flood-plain steps

Elevation: 4,720 to 4,880 feet (1,440 to 1,487 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Ives and similar soils: 40 percent

Bebeever family and similar soils: 25 percent

Oxyaquic Torripsamments and similar soils: 25 percent

Minor Components: 10 percent

-Ives and similar soils that have a water table between 20 and 40 inches

Soil Properties and Qualities

Ives soils

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

Geomorphic position: occurs on flood-plain steps

Parent material: alluvium derived from sandstone and siltstone

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: 70 percent

-woody debris: 0 percent

-bare soil: 30 percent

rock fragments: 0 percent

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: rare

Runoff class: very low

Hydrologic group: A

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

Ecological site number: R035XB210AZ

Present vegetation: alkali sacaton, black grama, fourwing saltbush, Indian ricegrass, bottlebrush squirreltail, galleta

Land capability (irrigated): 2w

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 6' 40.11" north, 111° 13' 8.32" west

C1—0 to 8 inches (0 to 20 cm); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4), moist; 10 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

C2—8 to 19 inches (20 to 48 cm); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4), moist; 10 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

C3—19 to 28 inches (48 to 71 cm); reddish brown (2.5YR 5/4) fine sandy loam, reddish brown (2.5YR 4/4), moist; 10 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular

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pores; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

C4—28 to 36 inches (71 to 92 cm); reddish brown (2.5YR 5/4) fine sandy loam, red (2.5YR 4/6), moist; 10 percent clay; single grain; loose, nonsticky, nonplastic; common very fine and fine roots; many very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

C5—36 to 60 inches (92 to 152 cm); reddish brown (2.5YR 5/4) loamy fine sand, red (2.5YR 4/6), moist; 6 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; few very fine and fine roots; common very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

Range in Characteristics

Particle-size control section clay content: 5 to 14 percent

C1, A horizons

Hue: 5YR

Value: 5 dry, 4 moist

Chroma: 4, dry or moist

Texture: fine sandy loam, sandy loam

Clay: 5 to 15 percent

Calcium carbonate equivalent: 0 to 2 percent

SAR: 1 to 4

Reaction: strongly alkaline

C horizon

Hue: 5YR, 2.5YR

Value: 5 dry, 4 moist

Chroma: 4 dry, 4 or 6 moist

Texture: fine sandy loam, sandy loam, loamy fine sand

Clay: 2 to 15 percent

Calcium carbonate equivalent: 0 to 2 percent

SAR: 1 to 4

Reaction: strongly alkaline

Bebevar family soils

Taxonomic classification: Sandy, mixed, mesic Oxyaquic Torrfluvents

Geomorphic position: occurs on flood-plain steps

Parent material: eolian sands over alluvium derived from sandstone and siltstone

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: 70 percent

-woody debris: 0 percent

-bare soil: 30 percent

rock fragments: 0 percent

Drainage class: moderately well drained

Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

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Available water capacity total inches: 6.8 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: rare
Seasonal water table minimum depth: about 52 to 60 inches
Runoff class: low
Hydrologic group: B
Ecological site name: Loamy Bottom 6-10" p.z. Subirrigated, Saline
Ecological site number: R035XB212AZ
Present vegetation: inland saltgrass, rush, sedge
Land capability (irrigated): 4w
Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 36° 7' 55.24" north, 111° 12' 49.67" west

A—0 to 3 inches (0 to 8 cm); reddish brown (5YR 5/3) loamy fine sand, reddish brown (5YR 5/3), moist; 6 percent clay; weak fine subangular blocky structure; hard, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular, and many very fine and fine tubular pores; slightly effervescent, 1 percent calcium carbonate equivalent; very strongly alkaline, pH 9.4; abrupt smooth boundary.

Cn1—3 to 11 inches (8 to 28 cm); light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4), moist; 6 percent clay; single grain; hard, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores; very slightly effervescent, 1 percent calcium carbonate equivalent; very strongly alkaline, pH 9.4; abrupt smooth boundary.

Cn2—11 to 18 inches (28 to 46 cm); reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4), moist; 15 percent clay; massive; hard, friable, nonsticky, nonplastic; many very fine and fine roots; common very fine and fine irregular, and common very fine and fine tubular pores; 2 percent masses of oxidized iron; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt smooth boundary.

Cn3—18 to 31 inches (46 to 79 cm); light reddish brown (5YR 6/3) loamy fine sand, reddish brown (5YR 4/3), moist; 6 percent clay; massive; hard, very friable, nonsticky, nonplastic; many very fine and fine roots; common very fine and fine irregular pores; very few manganese or iron-manganese stains; very slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear smooth boundary.

C1—31 to 46 inches (79 to 117 cm); light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4), moist; 6 percent clay; massive; hard, very friable, nonsticky, nonplastic; many very fine and fine roots; common very fine and fine irregular pores; very slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

C2—46 to 52 inches (117 to 132 cm); reddish brown (5YR 5/3) loamy fine sand, reddish brown (5YR 4/3), moist; 6 percent clay; massive; hard, very friable, nonsticky, nonplastic; common very fine and fine roots; common very fine and fine irregular pores; very slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Cg—52 to 60 inches (132 to 152 cm); light gray (10YR 7/1) very fine sandy loam, dark gray (10YR 4/1), moist; 13 percent clay; massive; hard, very friable, nonsticky, nonplastic; few very fine and fine roots; common very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

Range in Characteristics

Bebeever family differs from the series because it has 5YR hues, a very strongly alkaline reaction class, and gleyed horizons which are outside the range of the series.

Particle-size control section clay content: 5 to 16 percent

A horizon

Hue: 5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 3 to 6, dry or moist
Texture: loamy very fine sand, loamy fine sand, loamy sand
Clay: 2 to 10 percent
Calcium carbonate equivalent: 0 to 2 percent
SAR: 1 to 4
Reaction: strongly alkaline to very strongly alkaline

Cn horizon

Hue: 5YR
Value: 4 to 6, dry or moist
Chroma: 3 to 6, dry or moist
Texture: loamy fine sand, sandy loam, loam
Clay: 2 to 10 percent
Calcium carbonate equivalent: 0 to 2 percent
SAR: 1 to 12
Reaction: strongly alkaline to very strongly alkaline

C horizon

Hue: 5YR
Value: 4 to 6, dry or moist
Chroma: 2 to 6, dry or moist
Texture: loamy fine sand, loam
Clay: 2 to 20 percent
Calcium carbonate equivalent: 0 to 2 percent
SAR: 1 to 12
Reaction: strongly alkaline to very strongly alkaline

Cg horizon

Hue: 5YR, 10YR
Value: 6 or 7 dry, 3 or 4 moist
Chroma: 1 or 2, dry or moist
Texture: loamy fine sand, very fine sandy loam
Clay: 10 to 15 percent
Calcium carbonate equivalent: 0 to 2 percent
SAR: 1 to 4
Reaction: strongly alkaline

Oxyaquic subgroup: saturation between 52 and 60 inches (13 to 150 cm) for more than 1 month in most years.

Oxyaquic Torripsammets soils

Taxonomic classification: Mixed, mesic Oxyaquic Torripsammets

Geomorphic position: occurs on flood-plain steps

Parent material: eolian sands over alluvium derived from sandstone and siltstone

Slope: 0 to 3 percent

Surface cover:

Biological crust
-cyanobacteria: 0 percent

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-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
rock fragments: 0 percent
Drainage class: moderately 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: 7.0 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: rare
Seasonal water table minimum depth: about 35 to 54 inches
Runoff class: very low
Hydrologic group: B
Ecological site name: Loamy Bottom 6-10" p.z. Subirrigated, Saline
Ecological site number: R035XB212AZ
Present vegetation: alkali sacaton, desert saltgrass, Indian ricegrass, fourwing saltbush
Land capability (irrigated): 4w
Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 36° 7' 38.23" north, 111° 12' 39.20" west

A1—0 to 1 inch (0 to 3 cm); reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4), moist; 6 percent clay; single grain; loose, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; very strongly alkaline, pH 9.2; abrupt smooth boundary.

Cn1—1 inch to 11 inches (3 to 28 cm); reddish yellow (5YR 6/6) loamy fine sand, light reddish brown (5YR 6/4), moist; 6 percent clay; single grain; loose, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 9.0; clear smooth boundary.

Cn2—1 29 inches (28 to 74 cm); reddish yellow (5YR 6/6) loamy fine sand, light reddish brown (5YR 6/4), moist; 6 percent clay; single grain; loose, nonsticky, nonplastic; many very fine and fine roots; many very fine and fine irregular pores; noneffervescent; strongly alkaline, pH 9.0; abrupt smooth boundary.

Cn3—29 to 34 inches (74 to 86 cm); reddish yellow (5YR 6/6) loamy fine sand, light reddish brown (5YR 6/4), moist; 6 percent clay; single grain; loose, nonsticky, nonplastic; common coarse, very fine, and fine roots; many very fine and fine irregular pores; 2 percent masses of oxidized iron; strongly effervescent, 2 percent calcium carbonate equivalent; very strongly alkaline, pH 9.2; clear smooth boundary.

Cng1—34 to 42 inches (86 to 107 cm); light gray (2.5Y 7/2) fine sand, light brownish gray (2.5Y 6/2), moist; 3 percent clay; massive; slightly hard, loose, nonsticky, nonplastic; common coarse roots, very fine and fine roots; many very fine and fine

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irregular pores; 2 percent masses of oxidized iron; strongly effervescent, 2 percent calcium carbonate equivalent; very strongly alkaline, pH 9.2; clear smooth boundary.

Cg1—42 to 47 inches (107 to 119 cm); light gray (2.5Y 7/2) fine sand, light brownish gray (2.5Y 6/2), moist; 3 percent clay; massive; slightly hard, loose, nonsticky, nonplastic; common coarse, very fine, and fine roots; many very fine and fine irregular pores; 20 percent masses of oxidized iron; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; gradual smooth boundary.

C1—47 to 54 inches (119 to 137 cm); light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4), moist; 6 percent clay; massive; slightly hard, loose, nonsticky, nonplastic; common coarse and many very fine and fine roots; many very fine and fine irregular pores; 2 percent masses of reduced iron; strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear smooth boundary.

C2—54 to 63 inches (137 to 160 cm); light reddish brown (5YR 6/3) silt loam, reddish brown (5YR 4/3), moist; 10 percent clay; massive; slightly hard, friable, slightly sticky, slightly plastic; few coarse and many fine roots; common very fine and fine irregular pores; strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

C3—63 to 66 inches (160 to 168 cm); pinkish gray (5YR 7/2) very fine sandy loam, reddish brown (5YR 5/3), moist; 13 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; few coarse and common fine roots; common very fine irregular and few fine tubular pores; strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

Range in Characteristics

Oxyaquic Torripsamments have soil properties that vary outside of family class limits.

Particle-size control section clay content: 2 to 9 percent

A horizon

Hue: 5YR

Value: 5 to 6 dry, 4 to 6 moist

Chroma: 4 to 6, dry or moist

Texture: loamy very fine sand, loamy fine sand

Clay: 2 to 6 percent

Calcium carbonate equivalent: 0 to 2 percent

SAR: 1 to 12

EC: 0 to 4

Reaction: strongly alkaline to very strongly alkaline

Cn, C horizons

Hue: 5YR, 2.5YR

Value: 5 or 6 dry, 4 to 6 moist

Chroma: 2 to 6, dry or moist

Texture: loamy fine sand, very fine sandy loam, silt loam

Clay: 2 to 15 percent

Calcium carbonate equivalent: 0 to 4 percent

SAR: 1 to 12

EC: 0 to 4

Reaction: moderately alkaline to very strongly alkaline

Cng, Cg horizons

Hue: 5YR, 2.5YR

Value: 5 or 7 dry, 3 to 6 moist

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Chroma: 2 to 8 dry, 2 to 6 moist
Texture: fine sand, loamy fine sand
Clay: 1 to 5 percent
Calcium carbonate equivalent: 0 to 4 percent
SAR: 1 to 12
EC: 0 to 4
Reaction: moderately alkaline to very strongly alkaline

Oxyaquic subgroup: saturation between 35 and 54 inches (89 to 137 cm) for more than 1 month in most years.

17—Ives-Jocity complex, 1 to 4 percent slopes

Map Unit Setting

Landform(s): flood-plain steps
Elevation: 4,720 to 5,040 feet (1,439 to 1,535 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Ives and similar soils: 60 percent
Jocity and similar soils: 30 percent
Minor components: 10 percent
-Aquic Torriorthents and similar soils

Soil Properties and Qualities

Ives soils

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

Geomorphic position: occurs on flood-plain steps

Parent material: 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: 0 percent

-gypsum: 0 percent

Physical cover

-canopy plant cover: 10 percent

-woody debris: 0 percent

-bare soil: 90 percent

rock fragments: 0 percent

Drainage class: somewhat excessively drained

Ksat solum: 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

Available water capacity total inches: 7.1 (high)

Shrink-swell potential: about 1.5 LEP (low)

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Flooding hazard: occasional

Runoff class: very low

Hydrologic group: A

Ecological site name: Loamy Wash 6-10" p.z.

Ecological site number: R035XB209AZ

Present vegetation: western wheatgrass, alkali sacaton, fourwing saltbush

Land capability (irrigated): 3w

Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 36° 8' 1.80" north, 111° 19' 22.60" west

C1—0 to 2 inches (0 to 5 cm); reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4), moist; 7 percent clay; weak thin platy parts to single grain; soft, loose, nonsticky, nonplastic; few very fine and fine roots; few very fine and fine tubular pores; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual smooth boundary.

C2—2 to 18 inches (5 to 44 cm); reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4), moist; 8 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; common very fine and fine tubular pores; strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual wavy boundary.

C3—18 to 44 inches (44 to 112 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 12 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; common very fine and fine tubular pores; strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Ck—44 to 52 inches (112 to 132 cm); light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4), moist; 16 percent clay; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine and fine roots; common very fine and fine tubular pores; common carbonate masses in matrix; strongly effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; gradual wavy boundary.

Bk—52 to 60 inches (132 to 152 cm); light reddish brown (5YR 6/4) loam, reddish brown (5YR 5/4), moist; 22 percent clay; weak medium subangular blocky structure; moderately hard, friable, slightly sticky, slightly plastic; few very fine and fine roots; common very fine and fine tubular pores; many carbonate masses in matrix; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

Range in Characteristics

Particle-size control section clay content: 5 to 13 percent

C horizon

Hue: 5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 4 to 6, dry or moist

Texture: sand, loamy sand, loamy fine sand, fine sandy loam, sandy loam

Clay: 4 to 20 percent

Calcium carbonate equivalent: 0 to 15 percent

SAR: 0 to 4

Reaction: strongly alkaline

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Bk horizon

Hue: 5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 4 to 6 dry, 3 to 6 moist

Texture: sand, fine sand, loamy fine sand, fine sandy loam, sandy loam, loam

Clay: 18 to 26 percent

Calcium carbonate equivalent: 15 to 25 percent

SAR: 0 to 4

Reaction: strongly alkaline

Some pedons have a Bk horizon with small accumulations of calcium carbonate.

Jocity soils

Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrfluvents

Geomorphic position: occurs on flood-plain steps

Parent material: alluvium derived from sandstone

Slope: 1 to 4 percent

Surface cover:

Biologic crust

-cyanobacteria: 0 percent

-lichen: 0 percent

-moss: 0 percent

Chemical cover

-salt: 0 percent

-gypsum: 0 percent

Physical cover

-canopy plant cover: 10 percent

-woody debris: 0 percent

-bare soil: 90 percent

rock fragments: 0 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: 8.9 (high)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: occasional

Runoff class: low

Hydrologic group: C

Ecological site name: Loamy Wash 6-10" p.z.

Ecological site number: R035XB209AZ

Present vegetation: western wheatgrass, alkali sacaton, fourwing saltbush

Land capability (irrigated): 3w

Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 36° 8' 21.50" north, 111° 20' 17.70" west

A—0 to 3 inches (0 to 8 cm); reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4), moist; 14 percent clay; weak thick platy parts to weak fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common very fine roots; many very fine vesicular pores; strongly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; gradual smooth boundary.

C1—3 to 14 inches (8 to 36 cm); reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4), moist; 16 percent clay; weak medium subangular blocky parts to weak

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fine granular structure; moderately hard, friable, nonsticky, nonplastic; common very fine roots; many very fine and few fine tubular pores; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Ck1—14 to 38 inches (36 to 97 cm); light reddish brown (5YR 6/4) loam, reddish brown (5YR 5/4), moist; 24 percent clay; weak medium subangular blocky structure; moderately hard, firm, slightly sticky, slightly plastic; common very fine and few fine roots; common very fine and few fine tubular pores; few carbonate coats on surfaces along root channels; strongly effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.7; abrupt smooth boundary.

Ck2—38 to 60 inches (97 to 152 cm); light reddish brown (5YR 6/4) stratified clay loam, reddish brown (5YR 5/4), moist; 32 percent clay; weak medium subangular blocky parts to weak thin platy structure; hard, firm, slightly sticky, moderately plastic; few very fine and fine roots; common very fine and few fine tubular pores; few carbonate coats on surfaces along pores; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.7.

Range in Characteristics

Particle-size control section clay content: 17 to 25 percent

A, C horizons

Hue: 5YR

Value: 4 or 5, dry or moist

Chroma: 4, dry or moist

Texture: fine sand, loamy fine sand, fine sandy loam, sandy loam

Clay: 10 to 18 percent

Calcium carbonate equivalent: 0 to 4 percent

Reaction: moderately alkaline to strongly alkaline

Ck Horizon

Hue: 5YR

Value: 4 to 6, dry or moist

Chroma: 4 to 6, dry or moist

Texture: sandy loam, loamy fine sand, loam, sandy clay loam, clay loam

Clay: 18 to 36 percent

Calcium carbonate equivalent: 1 to 25 percent

Reaction: strongly alkaline

Some pedons have Bk horizons with small accumulations of calcium carbonate.

18—Ives-Riverwash association, 0 to 2 percent slopes

Map Unit Setting

Landform(s): Ives on flood plains, Riverwash on channels,

Elevation: 4,460 to 4,610 feet (1,360 to 1,405 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Ives and similar soils: 55 percent

Riverwash: 25 percent

Minor Components: 20 percent
-Sheppard and similar soils
-Typic Torrfluvents and similar soils
-Begay and similar soils

Soil Properties and Qualities

Ives 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: 10 percent

-woody debris: 15 percent

-bare soil: 75 percent

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: negligible

Hydrologic group: A

Ecological site name: Loamy Bottom6-10" p.z. Perennial

Ecological site number: R035XB269AZ

Present vegetation: willow, saltcedar, rubber rabbitbrush, cottonwood

Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 36° 16' 4.25" , 111° 25' 28.95"

C1—0 to 5 inches (0 to 12 cm); reddish brown (5YR 5/4) fine sand, reddish brown (5YR 4/3), moist; 5 percent clay; single grain; loose, nonsticky, nonplastic; common fine roots; common fine interstitial pores; slightly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—5 to 11 inches (12 to 28 cm); reddish brown (5YR 5/3) very gravelly sand, dark reddish gray (5YR 4/2), moist; 4 percent clay; single grain; loose, nonsticky, nonplastic; common fine roots; common fine interstitial pores; 40 percent gravel; slightly effervescent, 3 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear wavy boundary.

C3—11 to 36 inches (28 to 90 cm); reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/3), moist; 10 percent clay; massive; slightly hard, friable, nonsticky,

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nonplastic; 2 percent gravel; strongly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; gradual wavy boundary.

C4—36 to 63 inches (90 to 160 cm); reddish brown (5YR 5/4) loamy sand, reddish brown (5YR 4/3), moist; 5 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; strongly effervescent, 3 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

Range in Characteristics

Ives, as used in this survey, is a taxadjunct to the series because it has a sandy particle size classification. Ives is a Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torrifuvents.

Rock fragments of the control section: 0 to 40 percent gravels

Particle-size control section clay content: 2 to 10 percent

C horizon

Hue: 5YR, 2.5YR

Value: 5 or 6 dry, 4 to 5 moist

Chroma: 3 or 4 dry, 2 or 3 moist

Texture: fine sand, loamy fine sand, sand, loamy sand

Clay: 2 to 10 percent

Calcium carbonate equivalent: 2 to 10 percent

Rock fragments: 0 to 45 percent gravels

Reaction: moderately alkaline to strongly alkaline

Riverwash

Slope: 0 to 2 percent

Unstabilized sandy, silty, clayey, or gravelly sediment that is flooded, washed, and reworked frequently by rivers, and usually is devoid of vegetation.

19—Jeddito-Joraibi complex, 0 to 5 percent slopes

Map Unit Setting

Landform(s): stream terraces

Elevation: 4,900 to 5,000 feet (1,494 to 1,524 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 120 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Jeddito and similar soils: 60 percent

Joraibi and similar soils: 30 percent

Minor Components: 10 percent

-Sheppard and similar soils

-Fine-loamy Typic Haplocambids

-Jocity and similar soils

Soil Properties and Qualities

Jeddito soils

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

Geomorphic position: occurs on upper stream terraces

Parent material: alluvium derived from sandstone and shale

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

rock fragments: 0 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: 7.2 (high)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: rare

Runoff class: very low

Hydrologic group: A

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

Ecological site number: R035XB210AZ

Present vegetation: alkali sacaton, black grama, fourwing saltbush, Indian ricegrass, bottlebrush squirreltail, galleta

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 32' 4.90" north, 110° 53' 45.70" west

A—0 to 1 inch (0 to 3 cm); light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4), moist; 10 percent clay; moderate medium platy structure; soft, loose, nonsticky, nonplastic; common very fine and fine roots; common very fine and fine vesicular pores; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C1—1 inch to 8 inches (3 to 20 cm); light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4), moist; 14 percent clay; strong coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; common very fine and fine vesicular pores; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C2—8 to 60 inches (20 to 152 cm); light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4), moist; 14 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; many medium, common very fine and fine vesicular pores; violently effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.5.

Range in Characteristics

Particle-size control section clay content: 2 to 14 percent

A horizon

Hue: 5YR

Value: 5 or 6 dry, 3 to 5 moist

Chroma: 4 or 6, dry or moist

Texture: loamy fine sand, sandy loam, fine sandy loam

Clay: 10 to 15 percent

Calcium carbonate equivalent: 1 to 4 percent

Reaction: moderately alkaline

C horizon

Hue: 5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 4 or 6 dry, 3 to 6 moist

Texture: stratified fine sandy loam, sandy loam, loamy sand, fine sand, sand

Clay: 2 to 15 percent

Calcium carbonate equivalent: 1 to 4 percent

Reaction: moderately alkaline to strongly alkaline

Some pedons contain strata of clay loam and sandy clay loam (20 to 40 percent clay) at depths of 25 to 45 inches (64 to 115 cm).

Joraibi soils

Taxonomic classification: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, mesic Typic Torrifuvents

Geomorphic position: occurs on lower stream terraces

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: 20 percent

-woody debris: 10 percent

-bare soil: 70 percent

rock fragments: 0 percent

Drainage class: well over 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: 8.0 (high)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: rare

Ponding hazard: occasional

Runoff class: low

Hydrologic group: C

Ecological site name: Clayey Fan 6-10" p.z.

Ecological site number: R035XB239AZ

Present vegetation: alkali sacaton, galleta, fourwing saltbush, bottlebrush squirreltail

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 31' 39.90" north, 110° 52' 52.80" west

A—0 to 6 inches (0 to 15 cm); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4), moist; 18 percent clay; moderate medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; few very fine and fine vesicular pores; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; abrupt smooth boundary.

C1—6 to 26 inches (15 to 66 cm); light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 4/4), moist; 24 percent clay; strong medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few very fine and fine roots; few medium, very fine, and fine vesicular pores; violently effervescent, 27 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C2—26 to 36 inches (66 to 91 cm); brown (7.5YR 5/4) sandy clay, brown (7.5YR 4/4), moist; 47 percent clay; strong medium subangular blocky structure; very hard, very firm, slightly sticky, slightly plastic; few very fine roots; few medium, very fine, and fine vesicular pores; violently effervescent, 27 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; abrupt smooth boundary.

2C—36 to 60 inches (91 to 152 cm); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4), moist; 12 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine vesicular pores; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.1.

Range in Characteristics

Particle-size control section clay content: 25 to 35 percent in the upper part and 12 to 18 percent in the lower part

A horizon

Hue: 7.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4, dry or moist
Texture: 12 to 18 percent
Clay: fine sandy loam, sandy clay loam, clay loam
Calcium carbonate equivalent: 10 to 25 percent
SAR: 0 to 2
Reaction: moderately alkaline

C horizon

Hue: 7.5YR
Value: 4 to 6 dry, 4 or 5 moist
Chroma: 4, dry or moist
Texture: sandy clay loam, clay loam, sandy clay
Clay: 20 to 47 percent
Calcium carbonate equivalent: 15 to 30 percent
SAR: 0 to 12
Reaction: moderate alkaline to strongly alkaline

2C horizon

Hue: 7.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4, dry or moist
Texture: loamy fine sand, loamy sand
Clay: 12 to 18 percent

Calcium carbonate equivalent: 15 to 30 percent
SAR: 0 to 12
Reaction: moderate alkaline to strongly alkaline

20—Jocity sandy clay loam, 0 to 2 percent slopes

Map Unit Setting

Landform(s): flood-plain steps
Elevation: 4,520 to 4,840 feet (1,378 to 1,475 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Jocity and similar soils: 80 percent
Minor Components: 20 percent
-Soils that have a fine-silty particle-size control section
-Soils that have a cambic horizon

Soil Properties and Qualities

Jocity soils

Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrfluvents
Geomorphic position: occur on flood-plain steps
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: 80 percent
-woody debris: 0 percent
-bare soil: 20 percent
rock fragments: 0 percent
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: 7.8 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: occasional
Runoff class: negligible
Hydrologic group: B
Ecological site name: Loamy Upland 6-10" p.z.
Ecological site number: R035XB210AZ

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Present vegetation: alkali sacaton, black grama, fourwing saltbush, Indian ricegrass, bottlebrush squirreltail, galleta

Land capability (irrigated): 3w

Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 36° 6' 26.49" north, 111° 14' 55.35" west

Ap—0 to 10 inches (0 to 25 cm); brown (10YR 5/3) sandy clay loam, brown (10YR 4/3), moist; 28 percent clay; moderate medium subangular blocky structure; hard, firm, moderately sticky, slightly plastic; common very fine and fine roots; common very fine and fine interstitial and tubular pores; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C1—10 to 13 inches (25 to 33 cm); brown (10YR 5/3) sandy clay loam, brown (10YR 4/3), moist; 28 percent clay; moderate medium subangular blocky structure; hard, firm, moderately sticky, slightly plastic; common very fine and fine roots; common very fine and fine interstitial and tubular pores; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

C2—13 to 20 inches (33 to 51 cm); pale brown (10YR 6/3) sandy clay loam, brown (10YR 4/3), moist; 28 percent clay; moderate medium subangular blocky structure; hard, firm, moderately sticky, slightly plastic; common very fine and fine roots; common very fine and fine interstitial and tubular pores; 2 percent fine masses of oxidized iron; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

C3—20 to 29 inches (51 to 74 cm); pale brown (10YR 6/3) sandy clay loam, brown (10YR 4/3), moist; 28 percent clay; moderate medium subangular blocky structure; hard, firm, moderately sticky, slightly plastic; common very fine and fine roots; common very fine and fine interstitial and tubular pores; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C4—29 to 34 inches (74 to 86 cm); pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3), moist; 13 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; many very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C5—34 to 60 inches (86 to 152 cm); pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3), moist; 6 percent clay; massive parts to single grain; loose, nonsticky, nonplastic; few very fine and fine roots; many very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

Range in Characteristics

Particle-size control section clay content: 15 to 27 percent

A, C horizons

Hue: 2.5YR to 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

Texture: stratified sandy clay loam, fine sandy loam, loamy fine sand

Clay: 2 to 35 percent

Calcium carbonate equivalent: 0 to 4 percent

Reaction: moderately alkaline to strongly alkaline

21—Jocity-Joraibi-Navajo-Riverwash complex, 0 to 2 percent slopes

Map Unit Setting

Landform(s): channels, flood plains

Elevation: 4,690 to 5,100 feet (1,430 to 1,555 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Jocity and similar soils: 40 percent

Navajo and similar soils: 15 percent

Joraibi and similar soils: 15 percent

Riverwash: 10 percent

Minor Components: 20 percent

-Tours and similar soils

-Typic Haplocambids and similar soils

Soil Properties and Qualities

Jocity soils

Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrifuvents

Geomorphic position: occurs on flood plains

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: 20 percent

-woody debris: 18 percent

-bare soil: 62 percent

rock fragments: 0 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: 9.8 (high)

Shrink-swell potential: about 7.5 LEP (high)

Flooding hazard: frequent

Runoff class: medium

Hydrologic group: C

Ecological site name: Sandy Wash6-10" p.z.

Ecological site number: R035XB216AZ

Present vegetation: rubber rabbitbrush, fourwing saltbush, Bailey greasewood, saltcedar, annual sunflower, Russian thistle

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Land capability (irrigated): 3w

Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 35° 5' 39.90" north, 110° 50' 0.80" west

A—0 to 5 inches (0 to 13 cm); light reddish brown (5YR 6/3) stratified clay loam, reddish gray (5YR 5/2), moist; 35 percent clay; moderate thin platy structure; soft, very friable, moderately sticky, moderately plastic; few medium and common very fine and fine roots; common very fine vesicular pores; violently effervescent, 5 percent calcium carbonate equivalent and 1 percent gypsum; moderately alkaline, pH 8.2; gradual smooth boundary.

C1—5 to 31 inches (13 to 79 cm); pinkish gray (5YR 6/2) stratified silt loam, reddish gray (5YR 5/2), moist; 26 percent clay; moderate thin platy structure; slightly hard, friable, moderately sticky, moderately plastic; few medium and common very fine and fine roots; common very fine vesicular and few fine vesicular pores; violently effervescent, 5 percent calcium carbonate equivalent and 1 percent gypsum; moderately alkaline, pH 8.4; abrupt smooth boundary.

C2—31 to 42 inches (79 to 107 cm); pinkish gray (5YR 6/2) stratified silty clay, reddish gray (5YR 5/2), moist; 45 percent clay; moderate thin platy structure; very hard, firm, very sticky, moderately plastic; many very fine and common fine roots; common very fine vesicular and few fine vesicular pores; violently effervescent, 5 percent calcium carbonate equivalent and 1 percent gypsum; strongly alkaline, pH 8.6; abrupt wavy boundary.

C3—42 to 58 inches (107 to 147 cm); light reddish brown (5YR 6/3) loamy fine sand, reddish brown (5YR 5/3), moist; 7 percent clay; massive; loose, nonsticky, nonplastic; few very fine and fine roots; few fine irregular pores; strongly effervescent, 2 percent calcium carbonate equivalent and 1 percent gypsum; strongly alkaline, pH 8.6; abrupt wavy boundary.

C4—58 to 65 inches (147 to 165 cm); pinkish gray (5YR 6/2) stratified sandy clay loam, reddish gray (5YR 5/2), moist; 34 percent clay; moderate thin platy structure; hard, firm, very sticky, moderately plastic; common very fine and few fine roots; common very fine vesicular pores; violently effervescent, 5 percent calcium carbonate equivalent and 1 percent gypsum; moderately alkaline, pH 8.4.

Range in Characteristics

Particle-size control section clay content: 26 to 35 percent

A horizon

Hue: 5YR, 7.5YR

Value: 5 or 6 dry, 3 to 5 moist

Chroma: 2 to 5, dry or moist

Texture: clay loam

Clay: 30 to 38 percent

Calcium carbonate equivalent: 2 to 10 percent

Reaction: slightly alkaline to moderately alkaline

C1 and C2 horizons

Hue: 5YR, 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

Texture: clay, silty clay, silt loam

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Clay: 20 to 55 percent
Calcium carbonate equivalent: 2 to 10 percent
SAR: 0 to 4
Reaction: slightly alkaline to strongly alkaline

C3 and C4 horizons

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

Joraibi soils

Taxonomic classification: Sandy over clayey, mixed, superactive, calcareous, mesic
Typic Torrfluvents

Geomorphic position: occurs on flood plains

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: 42 percent

-woody debris: 18 percent

-bare soil: 40 percent

rock fragments: 0 percent

Depth to restrictive feature(s): 33 to 38 inches to abrupt textural change

Drainage class: somewhat excessively drained

Ksat solum: 2.00 to 20.00 inches per hour (14.00 to 141.00 micrometers per second)

Ksat restrictive layer: 0.06 to 0.20 inches per hour (0.42 to 1.4 micrometers per second)

Available water capacity total inches: 3.3 (low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: occasional

Runoff class: high

Hydrologic group: C

Ecological site name: Loamy Wash 6-10" p.z. Saline

Ecological site number: R035XB211AZ

Present vegetation: alkali sacaton, fourwing saltbush, galleta, desert saltgrass

Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 35° 16' 21.80" north, 110° 54' 28.30" west

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C1—0 to 5 inches (0 to 13 cm); reddish brown (5YR 5/3) fine sandy loam, dark reddish brown (5YR 3/3), moist; 17 percent clay; single grain; loose, nonsticky, nonplastic; common very fine and fine roots; few fine irregular pores; strongly effervescent, 2 percent calcium carbonate equivalent and 1 percent gypsum; moderately alkaline, pH 8.4; gradual wavy boundary.

C2—5 to 27 inches (13 to 69 cm); reddish brown (5YR 5/3) stratified loamy fine sand, reddish brown (5YR 4/3), moist; 7 percent clay; massive; soft, very friable, nonsticky, nonplastic; few medium and common very fine roots; few fine irregular pores; strongly effervescent, 2 percent calcium carbonate equivalent and 1 percent gypsum; strongly alkaline, pH 8.6; gradual wavy boundary.

C3—27 to 36 inches (69 to 91 cm); reddish brown (5YR 5/3) stratified loamy sand, reddish brown (5YR 4/3), moist; 6 percent clay; moderate thin platy structure; soft, very friable, slightly sticky, nonplastic; common very fine and few fine roots; few very fine tubular pores; violently effervescent, 2 percent calcium carbonate equivalent and 1 percent gypsum; moderately alkaline, pH 8.4; abrupt smooth boundary.

2C1—36 to 41 inches (91 to 104 cm); reddish brown (2.5YR 4/3) stratified clay, dark reddish brown (5YR 3/3), moist; 55 percent clay; moderate thin platy structure; moderately hard, friable, moderately sticky, moderately plastic; few very fine and common fine roots; common very fine tubular pores; violently effervescent, 5 percent calcium carbonate equivalent and 1 percent gypsum; strongly alkaline, pH 8.6; abrupt smooth boundary.

2C2—41 to 60 inches (104 to 152 cm); reddish brown (5YR 5/3) sand, reddish brown (5YR 4/3), moist; 3 percent clay; massive; loose, nonsticky, nonplastic; few very fine roots; few fine irregular pores; strongly effervescent, 2 percent calcium carbonate equivalent and 1 percent gypsum; moderately alkaline, pH 8.4.

Range in Characteristics

Joraibi, as used in this survey, is a taxadjunct to the series because it has a sandy over clayey particle size class. Joraibi is a Fine-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, mesic Typic Torrifluvents.

Particle-size control section clay content: 7 to 15 percent in the upper part and 40 to 60 percent in the lower part

C1, A horizons

Hue: 5YR, 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: fine sandy loam, loamy fine sand, loamy sand, sand

Clay: 15 to 20 percent

Calcium carbonate equivalent: 2 to 5 percent

EC: 8 to 16

Reaction: moderately alkaline to strongly alkaline

C2 and C3 horizons

Hue: 5YR, 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

Texture: fine sandy loam, loamy sand, sand

Clay: 3 to 10 percent

Calcium carbonate equivalent: 2 to 5 percent

SAR: 0 to 4

Soil Survey of Little Colorado River Area, Arizona

EC: 8 to 16
Reaction: moderately alkaline to strongly alkaline

2C horizon

Hue: 2.5YR, 5YR, 7.5YR
Value: 3 to 5 dry, 3 or 4 moist
Chroma: 2 to 4, dry or moist
Texture: clay, sand
Clay: 1 to 60 percent
Calcium carbonate equivalent: 2 to 10 percent
SAR: 0 to 4
EC: 8 to 16
Reaction: moderately alkaline to strongly alkaline

Navajo soils

Taxonomic classification: Fine, mixed, superactive, calcareous, mesic Vertic
Torrifluvents

Geomorphic position: occurs on playas

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: 10 percent
- woody debris: 5 percent
- bare soil: 85 percent
- rock fragments: 0 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: 10.2 (very high)

Shrink-swell potential: about 7.5 LEP (high)

Flooding hazard: occasional

Runoff class: high

Hydrologic group: C

Ecological site name: Loamy Wash 6-10" p.z. Saline

Ecological site number: R035XB211AZ

Present vegetation: mound saltbush, Bailey greasewood, alkali sacaton, Russian
thistle

Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 35° 11' 4.70" north, 110° 43' 26.90" west

A—0 to 2 inches (0 to 5 cm); reddish brown (2.5YR 5/4) silty clay, reddish brown (2.5YR 4/4), moist; 45 percent clay; thin platy structure; hard, firm, very sticky, very plastic; common very fine and fine roots; common very fine vesicular pores; strongly effervescent, 5 percent calcium carbonate equivalent and 1 percent gypsum; strongly alkaline, pH 8.6; gradual smooth boundary.

Soil Survey of Little Colorado River Area, Arizona

Css1—2 to 7 inches (5 to 18 cm); light reddish brown (2.5YR 6/3) clay, reddish brown (2.5YR 5/3), moist; 48 percent clay; thick platy structure; hard, firm, very sticky, very plastic; few medium and common very fine roots; common very fine tubular pores; common slickensides; strongly effervescent, 5 percent calcium carbonate equivalent and 2 percent gypsum; strongly alkaline, pH 8.6; gradual smooth boundary.

Css2—7 to 29 inches (18 to 74 cm); reddish brown (2.5YR 4/4) silty clay, dark reddish brown (2.5YR 3/4), moist; 44 percent clay; moderate fine angular blocky structure; hard, firm, very sticky, very plastic; few very fine roots; common fine tubular pores; common slickensides; violently effervescent, 10 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.4; gradual wavy boundary.

Css3—29 to 54 inches (74 to 137 cm); reddish brown (2.5YR 4/4) silty clay loam, dark reddish brown (2.5YR 3/4), moist; 38 percent clay; moderate fine angular blocky structure; hard, firm, very sticky, very plastic; few very fine roots; common very fine tubular pores; common slickensides; violently effervescent, 10 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.4; gradual wavy boundary.

C—54 to 60 inches (137 to 152 cm); reddish brown (2.5YR 5/3) clay loam, reddish brown (2.5YR 4/3), moist; 35 percent clay; thick platy structure; hard, firm, very sticky, very plastic; few very fine roots; common very fine tubular and common fine tubular pores; violently effervescent, 10 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.4.

Range in Characteristics

Particle-size control section clay content: 35 to 50 percent

Soil cracks: many vertical cracks 1 inch wide from the surface to 3 inches deep

A horizon

Hue: 2.5YR, 5YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: silty clay, clay

Clay: 40 to 50 percent

Calcium carbonate equivalent: 2 to 10 percent

Reaction: moderately alkaline to strongly alkaline

Css, C horizons

Hue: 2.5YR, 5YR

Value: 4 to 6 dry, 3 or 5 moist

Chroma: 3 or 4, dry or moist

Texture: silty clay, clay, clay loam, silt clay loam

Clay: 35 to 50 percent

Calcium carbonate equivalent: 5 to 25 percent

Gypsum: 0 to 4 percent

Reaction: moderately alkaline to strongly alkaline

Slickensides: slickensides from 2 to 54 inches (5 to 137 cm), (Css horizon).

Vertic: surface cracking with 1-inch-wide cracks 3 inches deep across the soil surface.

Riverwash

Slope: 0 to 1 percent

Unstabilized sandy, silty, clayey, or gravelly sediment that is flooded, washed, and reworked frequently by rivers, and usually is devoid of vegetation.

22—Jocity-Tuba, complex, 1 to 3 percent slopes

Map Unit Setting

Landform(s): flood-plain steps, sand sheets, stream terraces
Elevation: 4,560 to 5,350 feet (1,390 to 1,630 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Jocity and similar soils: 70 percent
Tuba and similar soils: 20 percent
Minor Components: 10 percent
-Jeddito and similar soils

Soil Properties and Qualities

Jocity soils

Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic
Torrifluvents
Geomorphic position: occurs on flood-plain steps
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: 80 percent
-woody debris: 0 percent
-bare soil: 20 percent
rock fragments: 0 percent
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: 8.9 (high)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: occasional
Runoff class: medium
Hydrologic group: C
Ecological site name: Sandy Loam Upland 6-10" p.z.
Ecological site number: R035XB219AZ
Present vegetation: Indian ricegrass, black grama, blue grama, *Ephedra*
Land capability (irrigated): 3w
Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 36° 6' 13.61" north, 111° 11' 46.66" west

Ap—0 to 10 inches (0 to 25 cm); light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4), moist; 6 percent clay; single grain; loose, nonsticky, nonplastic; common very fine and fine roots; many very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C1—10 to 14 inches (25 to 36 cm); light reddish brown (5YR 6/4) loam, reddish brown (5YR 4/4), moist; 14 percent clay; massive; hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C2—14 to 21 inches (36 to 53 cm); light reddish brown (2.5YR 6/4) fine sandy loam, reddish brown (2.5YR 4/4), moist; 13 percent clay; massive; hard, very friable, nonsticky, nonplastic; common very fine and fine roots; common very fine and fine tubular pores; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C3—21 to 31 inches (53 to 79 cm); light reddish brown (2.5YR 6/3) silty clay loam, reddish brown (2.5YR 4/3), moist; 32 percent clay; massive; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; few very fine and fine tubular pores; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C4—31 to 34 inches (79 to 86 cm); light red (2.5YR 6/6) loamy fine sand, weak red (2.5YR 5/2), moist; 6 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; many very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

C5—34 to 40 inches (86 to 102 cm); pale red (2.5YR 6/2) silty clay loam, weak red (2.5YR 5/2), moist; 32 percent clay; weak fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine and fine tubular pores; strongly effervescent, 5 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

C6—40 to 42 inches (102 to 106 cm); pale brown (10YR 6/3) loamy very fine sand, brown (10YR 5/3), moist; 6 percent clay; single grain; loose, nonsticky, nonplastic; many very fine and fine irregular pores; strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

C7—42 to 53 inches (106 to 135 cm); light reddish brown (2.5YR 6/3) silty clay loam, reddish brown (2.5YR 4/3), moist; 32 percent clay; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine and fine tubular pores; strongly effervescent, 5 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

C8—53 to 60 inches (135 to 152 cm); light reddish brown (2.5YR 6/4) fine sandy loam, reddish brown (2.5YR 4/4), moist; 13 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; many very fine and fine irregular pores; strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

Range in Characteristics

Particle-size control section clay content: 20 to 29 percent

Soil Survey of Little Colorado River Area, Arizona

A horizon

Hue: 2.5YR to 10YR
Value: 4 to 6, dry or moist
Chroma: 3 or 4, dry or moist
Texture: stratified loamy fine sand
Clay: 2 to 10 percent
Calcium carbonate equivalent: 0 to 2 percent
SAR: 1 to 4
EC: 1 to 4
Reaction: moderately alkaline to strongly alkaline

C horizon

Hue: 2.5YR to 10YR
Value: 4 to 7 dry, 4 or 5 moist
Chroma: 2 to 6, dry or moist
Texture: stratified loamy fine sand, loamy very fine sand, fine sandy loam, loam, silty clay loam
Clay: 2 to 35 percent
Calcium carbonate equivalent: 0 to 10 percent
SAR: 1 to 4
EC: 1 to 4
Reaction: moderately alkaline to strongly alkaline

Tuba soils

Taxonomic classification: Mixed, mesic Typic Torripsamments

Geomorphic position: occurs on sand sheets over stream terraces

Parent material: eolian sands over 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
rock fragments: 0 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: 6.1 (moderate)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very low

Hydrologic group: A

Ecological site name: Sandy Upland 6-10" p.z.

Ecological site number: R035XB217AZ

Present vegetation: Indian ricegrass, needle and thread, black grama, galleta, blue grama, bottlebrush squirreltail, sand dropseed

Land capability (irrigated): 3s

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 6' 19.01" north, 111° 12' 16.29" west

Ap—0 to 6 inches (0 to 15 cm); pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3), moist; 6 percent clay; single grain; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; many very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C—6 to 33 inches (15 to 84 cm); light yellowish brown (10YR 6/4) loamy fine sand, dark yellowish brown (10YR 4/4), moist; 6 percent clay; single grain; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; many very fine and fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Ckn1—33 to 47 inches (84 to 119 cm); light reddish brown (5YR 6/4) fine sand, reddish brown (5YR 4/4), moist; 3 percent clay; single grain; loose, nonsticky, nonplastic; many very fine and fine irregular pores; few carbonate masses in matrix; strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear smooth boundary.

Ckn2—47 to 62 inches (119 to 157 cm); light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4), moist; 6 percent clay; single grain; loose, nonsticky, nonplastic; many very fine and fine irregular pores; few carbonate masses in matrix; strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 9.0; clear smooth boundary.

Ckn3—62 to 65 inches (157 to 165 cm); reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6), moist; 13 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; many very fine and fine irregular pores; few carbonate masses in matrix; strongly effervescent, 2 percent calcium carbonate equivalent; very strongly alkaline, pH 9.2.

Range in Characteristics

Particle-size control section clay content: 2 to 9 percent

A, C horizons

Hue: 5YR to 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

Texture: loamy fine sand, fine sand

Clay: 2 to 10 percent

Calcium carbonate equivalent: 0 to 2 percent

SAR: 1 to 13

EC: 1 to 4

Reaction: moderately alkaline to very strongly alkaline

Ckn horizon

Hue: 5YR to 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 or 6, dry or moist

Texture: loamy fine sand, fine sandy loam, fine sand

Clay: 1 to 15 percent

Calcium carbonate equivalent: 0 to 4 percent

SAR: 1 to 13

EC: 1 to 4

Reaction: moderately alkaline to very strongly alkaline

23—Lava Flows

Map Unit Setting

Landform(s): lava flows, plateaus

Elevation: 5,570 to 5,770 feet (1,699 to 1,760 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Lava flows: 100 percent

Lava flows

Slope: 15 to 90 percent

Typically have sharp, jagged surfaces, crevices, and angular blocks that are characteristic of lava. A little earth material may be in a few rocks and sheltered pockets, but the flows are virtually devoid of vegetation with the exception of lichens.

24—Leupp-Hoskinnini complex, 2 to 15 percent slopes

Map Unit Setting

Landform(s): structural benches

Elevation: 4,920 to 5,680 feet (1,500 to 1,730 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Leupp and similar soils: 45 percent

Hoskinnini and similar soils: 40 percent

Minor Components: 15 percent

-Typic Torriorthents and similar soils

-Typic Haplargids and similar soils

-Rock outcrop

Soil Properties and Qualities

Leupp soils

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

Geomorphic position: occurs on structural benches

Parent material: Shinarump conglomerate member derived residuum weathered from sandstone and/or mudstone

Soil Survey of Little Colorado River Area, Arizona

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: 65

-woody debris: 0 percent

-bare soil: 35

rock fragments

gravel: 5 percent

Depth to restrictive feature(s): 4 to 20 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: 0.9 (very low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: very high

Hydrologic group: D

Ecological site name: Shallow Loamy 6-10" p.z. Calcareous

Ecological site number: R035XB226AZ

Present vegetation: blackbrush, *Ephedra*, shadscale saltbush, porcupine pricklypear, galleta

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 13' 25.00" north, 111° 30' 36.00"

A—0 to 1 inch (0 to 3 cm); reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4), moist; 12 percent clay; weak medium platy structure; soft, very friable, slightly sticky, slightly plastic; common fine roots; common fine vesicular pores; 3 percent gravel; noneffervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bw1—1 inch to 4 inches (3 to 10 cm); reddish brown (5YR 5/4) loam, dark reddish brown (5YR 3/3), moist; 20 percent clay; weak medium subangular blocky parts to weak very fine subangular blocky structure; soft, very friable, moderately sticky, slightly plastic; common fine roots; many very fine interstitial pores; 5 percent gravel; slightly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear wavy boundary.

Bw2—4 to 6 inches (10 to 15 cm); reddish brown (5YR 4/4) channery clay loam, dark reddish brown (5YR 3/3), moist; 30 percent clay; moderate very fine subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; few very fine roots; many fine interstitial pores; 25 percent channer; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; very abrupt wavy boundary.

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

Range in Characteristics

Rock fragments of the control section: 7 to 17 percent gravels and channers
Particle-size control section clay content: 17 to 27 percent

A horizon

Hue: 5YR
Value: 5 dry, 4 moist
Chroma: 4, dry or moist
Texture: sandy loam, loam
Clay: 7 to 17 percent
Rock fragments: 0 to 5 percent gravels
Reaction: moderately alkaline

Bw horizon

Hue: 5YR
Value: 4 to 5 dry, 3 moist
Chroma: 4 dry, 3 moist
Texture: clay loam, sandy clay loam, loam
Clay: 15 to 35 percent
Calcium carbonate equivalent: 2 to 5 percent
Rock fragments: 0 to 30 percent gravels
Reaction: moderately alkaline to strongly alkaline

Hoskinnini soils

Taxonomic classification: Loamy, mixed, superactive, mesic Lithic Haplargids

Geomorphic position: occurs on structural benches

Parent material: Shinarump conglomerate member-derived residuum weathered from sandstone and/or mudstone

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: 65
-woody debris: 0 percent
-bare soil: 35
rock fragments
gravel: 10 percent

Depth to restrictive feature(s): 14 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 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 1.6 (very low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: very high

Hydrologic group: D

Ecological site name: Shallow Loamy 6-10" p.z. Calcareous

Ecological site number: R035XB226AZ

Soil Survey of Little Colorado River Area, Arizona

Present vegetation: blackbrush, *Ephedra*, shadscale saltbush, porcupine pricklypear, galleta

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 11' 15.00" north, 111° 28' 45.00"

A—0 to 2 inches (0 to 5 cm); reddish brown (5YR 4/4) loamy sand, reddish brown (5YR 4/3), moist; 3 percent clay; weak medium platy structure; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots; common very fine tubular pores; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw—2 to 5 inches (5 to 13 cm); reddish brown (5YR 5/4) sandy loam, yellowish red (5YR 4/6), moist; 6 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common very fine and fine roots; common very fine tubular pores; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear irregular boundary.

Bt1—5 to 12 inches (13 to 30 cm); yellowish red (5YR 4/6) gravelly sandy clay loam, 5YR 3/6 (5YR 3/6), moist; 25 percent clay; moderate coarse subangular blocky structure; moderately hard, firm, moderately sticky, slightly plastic; few medium and coarse, and many very fine and fine roots; common very fine tubular pores; common clay films on all faces of peds and common clay bridges between sand grains; 15 percent gravel; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual wavy boundary.

Bt2—12 to 15 inches (30 to 38 cm); yellowish red (5YR 4/6) very channery sandy clay loam, (5YR 3/6), moist; 25 percent clay; weak fine subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; few fine and medium roots; common very fine tubular pores; common clay bridges between sand grains and common clay films on all faces of peds; 50 percent channer; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; very abrupt wavy boundary.

R—15 inches (38 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 16 to 29 percent gravels and channers

Particle-size control section clay content: 13 to 25 percent

A horizon

Hue: 2.5YR, 5YR

Value: 4, dry or moist

Chroma: 4 dry, 3 moist

Texture: loamy sand, sandy loam

Clay: 2 to 5 percent

Calcium carbonate equivalent: 10 to 15 percent

Rock fragments: 0 to 10 percent gravels

Reaction: moderately alkaline

Bw horizon

Hue: 2.5YR, 5YR

Value: 4 to 5, dry or moist

Chroma: 4 or 6, dry or moist

Texture: sandy loam, loam

Soil Survey of Little Colorado River Area, Arizona

Clay: 5 to 10 percent
Calcium carbonate equivalent: 10 to 15 percent
Rock fragments: 0 to 10 percent gravels
Reaction: moderately alkaline

Bt horizon

Hue: 2.5YR, 5YR
Value: 3 to 4, dry or moist
Chroma: 4 or 6, dry or moist
Texture: sandy clay loam, sandy loam, loam
Clay: 20 to 30 percent
Calcium carbonate equivalent: 10 to 15 percent
Rock fragments: 10 to 55 percent gravels, and channers
Reaction: moderately alkaline

25—Mellenthin gravelly sandy loam, 0 to 8 percent slopes

Map Unit Setting

Landform(s): plateaus
Elevation: 5,000 to 6,200 feet (1,524 to 1,890 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau Sagebrush - Grasslands

Map Unit Composition

Mellenthin and similar soils: 80 percent
Minor Components: 20 percent
-Clayey Lithic Ustic Haplargids
-Coarse-loamy Cumulic Haplustolls
-Rock outcrop
-Soils that have lithic contact greater than 20 inches

Soil Properties and Qualities

Mellenthin soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Lithic Ustic Haplocalcids

Geomorphic position: occurs on summits and gentle side slopes of plateaus and hills

Parent material: residuum weathered from limestone and 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: 50 percent

-woody debris: 10 percent

Soil Survey of Little Colorado River Area, Arizona

-bare soil: 40 percent
rock fragments
fine gravel: 15 percent
gravel: 15 percent
channer: 2 percent
flagstone: 5 percent

Depth to restrictive feature(s): 8 to 20 inches to bedrock, lithic

Drainage class: well drained

Ksat solum: 0.57 to 6.00 inches per hour (4.00 to 42.34 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: 1.7 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: low

Hydrologic group: D

Ecological site name: Shallow Loamy 10-14" p.z.

Ecological site number: R035XA119AZ

Present vegetation: black grama, blue grama, needle and thread, galleta, New Mexico feathergrass, bottlebrush squirreltail, winterfat, fourwing saltbush, Bigelow sagebrush

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 35° 11' 59.60" north, 111° 13' 43.10" west

A—0 to 2 inches (0 to 5 cm); pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 4/3), moist; 5 percent clay; weak medium platy structure; soft, very friable, nonsticky, nonplastic; many very fine and common fine and medium roots; common very fine vesicular and tubular pores; common carbonate concretions on bottom of rock fragments; 10 percent gravel and 5 percent channer; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; clear smooth boundary.

Bk1—2 to 10 inches (5 to 25 cm); light brown (7.5YR 6/3) very channery loam, brown (7.5YR 4/3), moist; 14 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few medium, many very fine, and common fine roots; common very fine tubular pores; few carbonate, finely disseminated and common carbonate concretions on bottom of rock fragments; few carbonate; 10 percent gravel, 20 percent channer, and 5 percent flagstone; strongly effervescent, 19 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear wavy boundary.

Bk2—10 to 18 inches (25 to 46 cm); pink (7.5YR 8/3) very channery very fine sandy loam, pink (7.5YR 7/3), moist; 12 percent clay; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and few fine roots; common very fine and fine tubular pores; many carbonate masses in matrix and many carbonate concretions on bottom of rock fragments; 10 percent gravel, 30 percent channer, and 15 percent flagstone; strongly effervescent, 35 percent calcium carbonate equivalent; strongly alkaline, pH 8.5; abrupt wavy boundary.

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

Range in Characteristics

Rock fragments of the control section: 35 to 80 percent gravels, channers, and flagstones

Particle-size control section clay content: 12 to 18 percent

A horizon

Hue: 10YR, 7.5YR

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, loam

Clay: 4 to 10 percent

Calcium carbonate equivalent: 5 to 15 percent

Rock fragments: 6 to 40 percent gravels, channers

Reaction: slightly alkaline to moderately alkaline

Bk horizon

Hue: 10YR, 7.5YR

Value: 6 to 8 dry, 4 to 7 moist

Chroma: 3 or 4, dry or moist

Texture: loam, very fine sandy loam, fine sandy loam

Clay: 12 to 18 percent

Calcium carbonate equivalent: 15 to 35 percent

Rock fragments: 35 to 80 percent gravels, channers, and flagstones

Reaction: slightly alkaline to strongly alkaline

Calcic horizon: the zone from 2 to 18 inches (5 to 46 cm), (Bk horizon)

26—Mellenthin-Placitas-Mellenthin, extremely stony, complex, 4 to 35 percent slopes

Map Unit Setting

Landform(s): plateaus

Elevation: 5,600 to 6,200 feet (1,707 to 1,890 meters)

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)

Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Mellenthin and similar soils: 40 percent

Placitas and similar soils: 30 percent

Mellenthin, extremely stony and similar soils: 20 percent

Minor Components: 10 percent

-Fine-silty Ustic Haplocalcids

Soil Properties and Qualities

Mellenthin soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Lithic Ustic Haplocalcids

Geomorphic position: occurs on summits of plateaus

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Parent material: colluvium derived from sandstone over residuum weathered from sandstone

Slope: 4 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: 20 percent

-woody debris: 10 percent

-bare soil: 70 percent

rock fragments

gravel: 25 percent

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 0.20 inches per hour (0.00 to 1.40 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: very high

Hydrologic group: D

Ecological site name: Shallow Loamy 10-14" p.z.

Ecological site number: R035XC319AZ

Present vegetation: Wyoming big sagebrush, blue grama, bottlebrush squirreltail, galleta, Hesperostipa, winterfat, Douglas rabbitbrush

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 23' 8.38" north, 111° 34' 34.26" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) very gravelly very fine sandy loam, dark brown (7.5YR 3/4), moist; 8 percent clay; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine roots; few very fine irregular pores; 40 percent gravel; strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Bk1—2 to 6 inches (5 to 15 cm); brown (7.5YR 5/4) gravelly loam, strong brown (7.5YR 4/6), moist; 12 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and few fine roots; common very fine and few fine irregular and tubular pores; few gypsum masses in matrix and common carbonate, finely disseminated; 25 percent gravel and 3 percent cobble; violently effervescent, 10 percent calcium carbonate equivalent and 1 percent gypsum; strongly alkaline, pH 8.6; abrupt smooth boundary.

2Bk2—6 to 12 inches (15 to 30 cm); brown (7.5YR 5/4) extremely cobbly very fine sandy loam, strong brown (7.5YR 4/6), moist; 12 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few medium, fine, and many very fine roots; common very fine irregular and tubular pores;

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few gypsum masses in matrix, common carbonate masses in matrix, and common carbonate concretions on bottom of rock fragments; 40 percent gravel and 30 percent cobble; violently effervescent, 10 percent calcium carbonate equivalent and 1 percent gypsum; strongly alkaline, pH 8.6; abrupt wavy boundary.

2Bk3—12 to 14 inches (30 to 36 cm); pink (7.5YR 7/4) extremely channery very fine sandy loam, brown (7.5YR 5/4), moist; 6 percent clay; single grain; loose, slightly sticky, slightly plastic; few medium, fine, and many very fine roots; few very fine irregular and common tubular pores; common carbonate, finely disseminated; 85 percent channer; violently effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; very abrupt wavy boundary.

3R—14 inches (36 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 43 to 67 percent gravels, cobbles, and channers
Particle-size control section clay content: 8 to 12 percent

A horizon

Hue: 5YR, 7.5YR
Value: 4 or 5 dry, 3 or 4 moist
Chroma: 4 or 6, dry or moist
Texture: very fine sandy loam, sandy loam
Clay: 4 to 10 percent
Calcium carbonate equivalent: 0 to 4 percent
Rock fragments: 35 to 55 percent gravels
Reaction: strongly alkaline

Bk horizon

Hue: 5YR, 7.5YR
Value: 5 to 7 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: very fine sandy loam, loam, fine sandy loam
Clay: 4 to 14 percent
Calcium carbonate equivalent: 2 to 15 percent
Gypsum: 0 to 2 percent
Rock fragments: 15 to 85 percent gravels, cobbles, and channers
Reaction: strongly alkaline

Calcic horizon: the zone from 2 to 12 inches (5 to 30 cm), (Bk1, Bk2 horizons)

Placitas soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Ustic
Haplocalcids

Geomorphic position: occurs on summits of plateaus

Parent material: colluvium derived from sandstone over residuum weathered 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

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-canopy plant cover: 20 percent
-woody debris: 10 percent
-bare soil: 70 percent
rock fragments
gravel: 15 percent
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: 2.5 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: high
Hydrologic group: C
Ecological site name: Shallow Loamy 10-14" p.z.
Ecological site number: R035XC319AZ
Present vegetation: Wyoming big sagebrush, blue grama, bottlebrush squirreltail, galleta, Hesperostipa, winterfat, Douglas rabbitbrush
Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 23' 53.83" north, 111° 34' 51.26" west

A—0 to 2 inches (0 to 5 cm); strong brown (7.5YR 5/6) very gravelly very fine sandy loam, strong brown (7.5YR 4/6), moist; 7 percent clay; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and few fine roots; common very fine and few fine irregular pores; 40 percent gravel; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bw—2 to 7 inches (5 to 18 cm); brown (7.5YR 5/4) gravelly loam, strong brown (7.5YR 4/6), moist; 11 percent clay; moderate coarse subangular blocky parts to moderate medium subangular blocky structure; slightly hard, very friable, moderately sticky, moderately plastic; many very fine and common fine roots; common very fine and few fine irregular pores; few gypsum masses in matrix; 20 percent gravel; strongly effervescent, 11 percent calcium carbonate equivalent and 1 percent gypsum; strongly alkaline, pH 8.6; clear smooth boundary.

Bk1—7 to 27 inches (18 to 69 cm); light brown (7.5YR 6/4) very gravelly fine sandy loam, strong brown (7.5YR 5/6), moist; 10 percent clay; moderate coarse and very coarse subangular blocky structure; moderately hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; many very fine vesicular and irregular pores; common carbonate nodules in matrix and many carbonate masses in matrix; 35 percent gravel and 5 percent cobble; violently effervescent, 22 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt wavy boundary.

Bk2—27 to 31 inches (69 to 79 cm); pink (7.5YR 8/3) extremely gravelly fine sandy loam, light brown (7.5YR 6/4), moist; 8 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; many very fine and common fine roots; common very fine vesicular pores; common carbonate nodules in matrix and many carbonate masses in matrix; 60 percent gravel and 10 percent cobble; violently effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt wavy boundary.

R—31 inches (79 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 35 to 60 percent gravels and cobbles
Particle-size control section clay content: 5 to 12 percent

A horizon

Hue: 5YR, 7.5YR
Value: 5 dry, 3 or 4 moist
Chroma: 6, dry or moist
Texture: very fine sandy loam
Clay: 5 to 7 percent
Calcium carbonate equivalent: 0 to 10 percent
Rock fragments: 35 to 55 percent gravels
Reaction: moderately alkaline

Bw horizon

Hue: 5YR, 7.5YR
Value: 4 or 5, dry or moist
Chroma: 4 or 6, dry or moist
Texture: very fine sandy loam, loam
Clay: 8 to 11 percent
Calcium carbonate equivalent: 5 to 15 percent
Gypsum: 0 to 2 percent
SAR: 0 to 4
Rock fragments: 15 to 30 percent gravels
Reaction: strongly alkaline

Bk horizon

Hue: 5YR, 7.5YR, 10YR
Value: 5 to 8 dry, 4 to 7 moist
Chroma: 3 or 4 dry, 4 to 6 moist
Texture: fine sandy loam, very fine sandy loam, loam
Clay: 5 to 12 percent
Calcium carbonate equivalent: 5 to 25 percent
SAR: 0 to 4
Rock fragments: 35 to 75 percent gravels and cobbles
Reaction: strongly alkaline

Calcic horizon: the zone from 7 to 31 inches (18 to 79 cm), (Bk horizon)

Mellenthin, extremely stony soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Lithic Ustic
Haplocalcids

Geomorphic position: occurs on side slopes of canyons

Parent material: colluvium derived from sandstone over residuum weathered from
sandstone

Slope: 15 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: 20 percent

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-woody debris: 10 percent
-bare soil: 70 percent
rock fragments
 gravel: 35 percent
 cobble: 25 percent
 stone: 7 percent
Depth to restrictive feature(s): 6 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 0.20 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 high
Hydrologic group: D
Ecological site name: Limestone/Sandstone Hills 10-14" p.z.
Ecological site number: R035XC308AZ
Present vegetation: Wyoming big sagebrush, fourwing saltbush, blue grama, bottlebrush squirreltail
Land capability (non irrigated): 8

Typical Profile

Location

Geographic Coordinate System: 36° 17' 5.55" north, 111° 36' 26.41" west

A1—0 to 1 inch (0 to 3 cm); brown (7.5YR 4/3) extremely cobbly fine sandy loam, very dark brown (7.5YR 2.5/3), moist; 10 percent clay; moderate medium platy parts to moderate fine granular structure; soft, very friable, nonsticky, nonplastic; few very fine roots; common very fine and few fine irregular pores; 35 percent gravel, 25 percent cobble, and 7 percent stone; noneffervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

A2—1 inch to 3 inches (3 to 8 cm); reddish brown (5YR 4/3) very cobbly very fine sandy loam, dark reddish brown (5YR 3/3), moist; 12 percent clay; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine irregular pores; 20 percent gravel, 20 percent cobble, and 5 percent stone; noneffervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bk1—3 to 8 inches (8 to 20 cm); reddish brown (5YR 5/4) very cobbly very fine sandy loam, reddish brown (5YR 4/4), moist; 12 percent clay; weak coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and few fine and medium roots; common very fine irregular and few fine tubular pores; few carbonate concretions on bottom of rock fragments; 20 percent gravel, 25 percent cobble, and 5 percent stone; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

Bk2—8 to 15 inches (20 to 38 cm); reddish brown (5YR 5/4) very stony very fine sandy loam, reddish brown (5YR 4/4), moist; 12 percent clay; moderate coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine and few fine and medium roots; common very fine irregular and few fine tubular pores; many carbonate concretions on bottom of rock fragments; 15 percent gravel, 20 percent cobble, and 20 percent stone; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

2C—15 to 19 inches (38 to 48 cm); light reddish brown (5YR 6/4) extremely flaggy sandy loam, reddish brown (5YR 4/4), moist; 8 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; 5 percent gravel, 5 percent channer, and 60 percent flagstone; violently effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

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

Range in Characteristics

Rock fragments of the control section: 45 to 61 percent gravels and cobbles

Particle-size control section clay content: 8 to 12 percent

A horizon

Hue: 5YR, 7.5YR

Value: 4 or 5 dry, 2.5 or 3 moist

Chroma: 3 or 4, dry or moist

Texture: fine sandy loam, very fine sandy loam

Clay: 8 to 12 percent

Calcium carbonate equivalent: 0 to 2 percent

Rock fragments: 60 to 75 percent gravels, cobbles, and stones

Reaction: moderately alkaline

Bk horizon

Hue: 5YR, 7.5YR

Value: 5 or 6 dry, 4 moist

Chroma: 4, dry or moist

Texture: very fine sandy loam, sandy loam

Clay: 10 to 12 percent

Calcium carbonate equivalent: 0 to 15 percent

Rock fragments: 35 to 55 percent gravels, cobbles, and stones

Reaction: moderately alkaline to strongly alkaline

2C horizon

Hue: 5YR, 7.5YR

Value: 5 or 6 dry, 4 moist

Chroma: 4, dry or moist

Texture: sand, loamy sand, sandy loam, loam

Clay: 8 to 10 percent

Calcium carbonate equivalent: 0 to 4 percent

SAR: 0 to 4

Rock fragments: 60 to 70 percent gravels, cobbles, and stones

Reaction: strongly alkaline

Calcic horizon: the zone from 8 to 15 inches (20 to 38 cm), (Bk2 horizon)

27—Mellenthin-Rock outcrop complex, 15 to 30 percent slopes

Map Unit Setting

Landform(s): escarpments, mountain slopes

Elevation: 5,300 to 6,530 feet (1,615 to 1,990 meters)

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)

Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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

Soil Survey of Little Colorado River Area, Arizona

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Mellenthin and similar soils: 60 percent

Rock outcrop: 30 percent

Minor Components: 10 percent

-Clayey Lithic Ustic Haplargids

-Loamy-skeletal carbonatic Ustic Haplocalcids

-Coarse-loamy Cumulic Haplustolls

Soil Properties and Qualities

Mellenthin soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Lithic Ustic Haplocalcids

Geomorphic position: occurs on plateaus and mesas

Parent material: colluvium derived from limestone over residuum weathered from limestone

Slope: 15 to 30 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: 0 percent

-bare soil: 25 percent

rock fragments

gravel: 30 percent

cobble: 5 percent

stone: 5 percent

channer: 10 percent

Depth to restrictive feature(s): 8 to 20 inches to bedrock, lithic

Drainage class: well drained

Ksat solum: 0.57 to 1.98 inches per hour (4.00 to 14.00 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: 1.7 (very low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: high

Hydrologic group: D

Ecological site name: Shallow Loamy 10-14" p.z.

Ecological site number: R035XA119AZ

Present vegetation: black grama, blue grama, Bigelow sagebrush, needle and thread, sideoats grama, dropseed, *Ephedra*, fourwing saltbush, galleta, juniper, Mexican cliffrose, winterfat

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 35° 52' 25.10" north, 111° 35' 9.30" west

C—0 to 3 inches (0 to 8 cm); brown (7.5YR 5/4) very gravelly sandy loam, brown (7.5YR 4/4), moist; 15 percent clay; single grain; loose, slightly sticky, nonplastic; few very fine roots; few very fine interstitial pores; 25 percent gravel and 10 percent cobble; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; gradual wavy boundary.

Bk1—3 to 10 inches (8 to 25 cm); brown (7.5YR 5/4) gravelly sandy loam, brown (7.5YR 4/4), moist; 17 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine interstitial pores; common carbonate, finely disseminated, and common carbonate concretions on bottom of rock fragments; 20 percent gravel and 5 percent cobble; violently effervescent, 16 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual wavy boundary.

Bk2—10 to 20 inches (25 to 49 cm); pink (5YR 7/3) very gravelly sandy loam, light reddish brown (5YR 6/3), moist; 14 percent clay; moderate medium subangular blocky structure; moderately hard, friable, slightly sticky, slightly plastic; few very fine roots; many carbonate, finely disseminated, and many carbonate concretions on bottom of rock fragments; 30 percent gravel, 10 percent cobble, and 5 percent stone; violently effervescent, 30 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

R—20 inches (49 cm); unfractured, unweathered limestone bedrock.

Range in Characteristics

Rock fragments of the control section: 35 to 65 percent gravels, cobbles, and stones
Particle-size control section clay content: 12 to 25 percent

C horizon

Hue: 7.5YR, 5YR

Value: 4 or 5, dry or moist

Chroma: 4, dry or moist

Texture: sandy loam, loam

Clay: 12 to 25 percent

Calcium carbonate equivalent: 0 to 4 percent

Rock fragments: 15 to 45 percent gravels and cobbles

Reaction: moderately alkaline

Bk horizon

Hue: 7.5YR, 5YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, loam

Clay: 12 to 25 percent

Calcium carbonate equivalent: 15 to 35 percent

Rock fragments: 20 to 80 percent gravels, cobbles and stones

Reaction: moderately alkaline to strongly alkaline

Calcic horizon: the zone from 3 to 20 inches (8 to 49 cm), (Bk horizon)

Rock outcrop

Slope: 20 to 35 percent

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.

28—Mellenthin-Rock outcrop complex, 30 to 70 percent slopes

Map Unit Setting

Landform(s): escarpments, hillsides

Elevation: 4,800 to 6,170 feet (1,463 to 1,880 meters)

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)

Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau Sagebrush - Grasslands

Map Unit Composition

Mellenthin and similar soils: 60 percent

Rock outcrop: 30 percent

Minor Components: 10 percent

-Clayey Lithic Ustic Haplargids

-Loamy-skeletal carbonatic Ustic Haplocalcids

-Coarse-loamy Cumulic Haplustolls

Soil Properties and Qualities

Mellenthin soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Lithic Ustic Haplocalcids

Geomorphic position: occurs on hillsides

Parent material: residuum weathered from limestone and sandstone

Slope: 30 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: 75 percent

-woody debris: 0 percent

-bare soil: 25 percent

rock fragments

gravel: 50 percent

cobble: 15 percent

stone: 4 percent

Depth to restrictive feature(s): 8 to 20 inches to bedrock, lithic

Drainage class: well drained

Ksat solum: 0.57 to 1.98 inches per hour (4.00 to 14.00 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: 1.0 (very low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: high

Soil Survey of Little Colorado River Area, Arizona

Hydrologic group: D

Ecological site name: Shallow Loamy 10-14" p.z.

Ecological site number: R035XA119AZ

Present vegetation: black grama, blue grama, Bigelow sagebrush, needle and thread, sideoats grama, dropseed, *Ephedra*, fourwing saltbush, galleta, juniper, Mexican cliffrose, winterfat

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 35° 42' 8.70" north, 111° 42' 27.40" west

C—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) very gravelly sandy loam, brown (7.5YR 4/3), moist; 16 percent clay; single grain; soft, very friable, slightly sticky, nonplastic; few very fine roots; few fine vesicular pores; common carbonate, finely disseminated; 30 percent gravel and 10 percent cobble; violently effervescent, 16 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual smooth boundary.

Bk—2 to 11 inches (5 to 28 cm); light brown (7.5YR 6/3) very gravelly sandy loam, brown (7.5YR 5/3), moist; 17 percent clay; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; few very fine roots; few very fine vesicular pores; many carbonate, finely disseminated; 40 percent gravel and 10 percent cobble; violently effervescent, 26 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

R—11 inches (28 cm); unfractured, unweathered limestone bedrock.

Range in Characteristics

Rock fragments of the control section: 35 to 62 percent gravels and cobbles

Particle-size control section clay content: 12 to 25 percent

C horizon

Hue: 7.5YR, 5YR

Value: 4 or 5, dry or moist

Chroma: 3, dry or moist

Texture: sandy loam, loam

Clay: 12 to 25 percent

Calcium carbonate equivalent: 5 to 20 percent

Rock fragments: 15 to 50 percent gravels and cobbles

Reaction: moderately alkaline to strongly alkaline

Bk horizon

Hue: 7.5YR, 5YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, loam

Clay: 12 to 25 percent

Calcium carbonate equivalent: 15 to 35 percent

Rock fragments: 25 to 65 percent gravels and cobbles

Reaction: moderately alkaline to strongly alkaline

Calcic horizon: the zone from 2 to 11 inches (6 to 28 cm), (Bk horizon)

Rock outcrop

Slope: 30 to 70 percent

Exposures of steep bedrock and cliffs, which are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

29—Meriwhitica-Wayneco-Tassi family, complex, 5 to 30 percent slopes

Map Unit Setting

Landform(s): structural benches

Elevation: 5,500 to 6,700 feet (1,676 to 2,042 meters)

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)

Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Meriwhitica and similar soils: 40 percent

Wayneco and similar soils: 25 percent

Tassi family and similar soils: 20 percent

Minor Components: 15 percent

-Typic Haplocalcids and similar soils

-Lithic Pertocalcids and similar soils

Soil Properties and Qualities

Meriwhitica soils

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

Geomorphic position: occurs on structural benches

Parent material: residuum weathered from limestone and sandstone

Slope: 7 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: 75 percent

-woody debris: 0 percent

-bare soil: 25 percent

rock fragments

gravel: 10 percent

cobble: 5 percent

stone: 5 percent

Depth to restrictive feature(s): 4 to 12 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)

Soil Survey of Little Colorado River Area, Arizona

Ksat restrictive layer: 0.00 to 0.06 inches per hour (0.00 to 0.42 micrometers per second)

Available water capacity total inches:

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very high

Hydrologic group: D

Ecological site name: Limestone/Sandstone Hills 10-14" p.z.

Ecological site number: R035XC308AZ

Present vegetation: blue grama, broom snakeweed, *Ephedra*, fourwing saltbush

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 30' 2.20" north, 111° 41' 9.80" west

C—0 to 5 inches (0 to 13 cm); light yellowish brown (10YR 6/4) very gravelly fine sandy loam, yellowish brown (10YR 5/4), moist; 12 percent clay; weak medium subangular blocky parts to weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine tubular pores; 40 percent gravel and 5 percent channer; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

R—5 inches (13 cm); unfractured, unweathered limestone and sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 35 to 55 percent gravels and cobbles

Particle-size control section clay content: 10 to 14 percent

C horizon

Hue: 10YR

Value: 6 dry, 5 moist

Chroma: 4, dry or moist

Texture: fine sandy loam, loam

Clay: 10 to 14 percent

Calcium carbonate equivalent: 10 to 20 percent

Rock fragments: 35 to 55 percent gravels and cobbles

Reaction: moderately alkaline

Wayneco soils

Taxonomic classification: Loamy, mixed, superactive, mesic Lithic Ustic Haplocalcids

Geomorphic position: occurs on structural benches

Parent material: colluvium derived from limestone over residuum weathered from limestone

Slope: 5 to 30 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: 0 percent

Soil Survey of Little Colorado River Area, Arizona

-bare soil: 25 percent
rock fragments
gravel: 20 percent
Depth to restrictive feature(s): 4 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: 0.00 to 0.06 inches per hour (0.00 to 0.42 micrometers per second)
Available water capacity total inches: 1.5 (very low)
Shrink-swell potential: about 0.5 LEP (low)
Flooding hazard: none
Runoff class: very high
Hydrologic group: D
Ecological site name: Limestone Upland 10-14" p.z.
Ecological site number: R035XC350AZ
Present vegetation: blue grama, broom snakeweed, fourwing saltbush, globemallow, goosefoot, squirreltail, Utah juniper
Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 35° 51' 5.20" north, 111° 40' 13.30" west

A—0 to 2 inches (0 to 5 cm); reddish brown (5YR 5/4) gravelly fine sandy loam, reddish brown (5YR 5/4), moist; 12 percent clay; moderate fine platy structure; soft, very friable, slightly sticky, slightly plastic; few very fine roots; few very fine interstitial pores; 15 percent gravel; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual smooth boundary.

Bk1—2 to 6 inches (5 to 15 cm); reddish brown (5YR 4/4) fine sandy loam, reddish brown (5YR 4/3), moist; 18 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; few very fine tubular pores; few fine carbonate masses in matrix; 10 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; gradual smooth boundary.

Bk2—6 to 13 inches (15 to 33 cm); light reddish brown (5YR 6/3) gravelly loam, reddish gray (5YR 5/2), moist; 16 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine tubular pores; few fine carbonate masses in matrix; 20 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; gradual smooth boundary.

R—13 inches (33 cm); unfractured, unweathered limestone bedrock.

Range in Characteristics

Rock fragments of the control section: 11 to 15 percent gravels

Particle-size control section clay content: 14 to 18 percent

A horizon

Hue: 5YR, 7.5YR

Value: 5, dry or moist

Chroma: 4, dry or moist

Texture: fine sandy loam, loam

Clay: 10 to 14 percent

Calcium carbonate equivalent: 5 to 15 percent

Soil Survey of Little Colorado River Area, Arizona

Rock fragments: 10 to 20 percent gravels

Reaction: moderately alkaline

Bk1 horizon

Hue: 5YR, 7.5YR

Value: 4 or 6 dry, 4 or 5 moist

Chroma: 3 or 4 dry, 2 or 3 moist

Texture: fine sandy loam, loam

Clay: 14 to 20 percent

Calcium carbonate equivalent: 10 to 25 percent

Rock fragments: 5 to 25 percent gravels

Reaction: moderately alkaline

Calcic horizon: the zone from 2 to 13 inches (5 to 33 cm), (Bk horizon)

Tassi family soils

Taxonomic classification: Loamy, mixed, superactive, mesic, shallow Ustic Petrocalcids

Geomorphic position: occurs on structural benches

Parent material: colluvium derived from calcareous sandstone over residuum weathered from calcareous sandstone

Slope: 5 to 30 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: 0 percent

-bare soil: 25 percent

rock fragments

gravel: 10 percent

Depth to restrictive feature(s): 8 to 16 inches to petrocalcic

Drainage class: well drained

Ksat solum: 0.60 to 2.00 inches per hour (4.23 to 14.11 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: 1.7 (very low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: medium

Hydrologic group: D

Ecological site name: Shallow Loamy 10-14" p.z.

Ecological site number: R035XC319AZ

Present vegetation: blue grama, broom snakeweed, fourwing saltbush

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 26' 11.80" north, 111° 46' 29.50" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) loam, brown (7.5YR 4/4), moist; 23 percent clay; weak thin platy parts to moderate medium granular structure; loose,

moderately sticky, moderately plastic; common very fine roots; common very fine tubular pores; 10 percent fine gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk—2 to 10 inches (5 to 25 cm); strong brown (7.5YR 5/6) loam, strong brown (7.5YR 4/6), moist; 25 percent clay; weak medium subangular blocky structure; soft, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular pores; common carbonate concretions on bottom of rock fragments; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bkkm—10 inches (25 cm); common strongly cemented carbonate concretions in matrix; cemented by calcium carbonate material, petrocalcic.

Range in Characteristics

Tassi family differs from the series because the series has a clay range of 5 to 18 percent and lithic bedrock contact below the pan.

Rock fragments of the control section: 1 to 30 percent gravels and cobbles

Particle-size control section clay content: 18 to 27 percent

A horizon

Hue: 7.5YR
Value: 5 dry, 4 moist
Chroma: 4, dry or moist
Texture: sandy loam, loam, sandy clay loam
Clay: 18 to 27 percent
Calcium carbonate equivalent: 5 to 15 percent
Rock fragments: 5 to 30 percent gravels
Reaction: moderately alkaline

Bk horizon

Hue: 7.5YR
Value: 5 dry, 4 moist
Chroma: 6, dry or moist
Texture: sandy loam, loam, sandy clay loam
Clay: 18 to 27 percent
Calcium carbonate equivalent: 5 to 15 percent
Rock fragments: 0 to 30 percent gravels
Reaction: moderately alkaline

Bkkm Horizon

Cementation kind: calcium carbonate
Cementation strength: indurated
Thickness: 5 inches (14 cm)

Petrocalcic horizon: the zone from 10 to 15 inches (25 to 39 cm), (Bkkm horizon)

30—Mespun-Councilor-Mespun, limy substratum complex, 0 to 10 percent slopes

Map Unit Setting

Landform(s): dune fields

Elevation: 5,400 to 5,900 feet (1,646 to 1,798 meters)

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)

Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 degrees C)

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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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Mesupun and similar soils: 55 percent

Councilor and similar soils: 20 percent

Mesupun, limy substratum and similar soils: 15 percent

Minor components: 10 percent

-Coarse-loamy and sandy soils that are less than 40 inches to lithic contact

-Rock outcrop

-Active dunes and sand sheets

-Gullied land

Soil Properties and Qualities

Mesupun soils

Taxonomic classification: Siliceous, mesic Ustic Torripsamments

Geomorphic position: occurs on stabilized dunes and sand sheets in dune fields

Parent material: eolian sands derived from Navajo 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: 35 percent

-woody debris: 2 percent

-bare soil: 65 percent

rock fragments: 0 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: 4.2 (low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: low

Hydrologic group: A

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

Ecological site number: R035XC315AZ

Present vegetation: *Ephedra*, blue grama, Douglas rabbitbrush

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Navajo Mountain Area, Arizona, Parts of Apache, Coconino, and Navajo Counties.

Location

Geographic Coordinate System: 36° 20' 24.30" north, 111° 8' 34.80" west

A—0 to 2 inches (0 to 5 cm); strong brown (7.5YR 5/6) fine sand, strong brown (7.5YR 4/6), moist; 3 percent clay; weak coarse subangular blocky structure; slightly hard,

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very friable, nonsticky, nonplastic; few very fine roots; common very fine and few fine tubular pores; noneffervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

C1—2 to 19 inches (5 to 48 cm); yellowish red (5YR 5/8) fine sand, yellowish red (5YR 4/6), moist; 5 percent clay; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; few fine tubular pores; noneffervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

C2—19 to 38 inches (48 to 97 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 4 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; few fine tubular pores; slightly effervescent, 3 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual smooth boundary.

C3—38 to 60 inches (97 to 152 cm); reddish yellow (5YR 6/8) fine sand, yellowish red (5YR 4/6), moist; 5 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; few fine tubular pores; noneffervescent; strongly alkaline, pH 8.6.

Range in Characteristics

Particle-size control section clay content: 2 to 8 percent

A horizon

Hue: 5YR, 7.5YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 4 or 6, dry or moist
Texture: fine sand, sand
Clay: 2 to 8 percent
Calcium carbonate equivalent: 0 to 4 percent
SAR: 0 to 13
Rock fragments: 0 to 5 percent gravels
Reaction: slightly alkaline to moderately alkaline

C horizon

Hue: 5YR, 7.5YR
Value: 4 to 6 dry, 3 to 6 moist
Chroma: 6 or 8, dry or moist
Texture: fine sand, sand, loamy sand
Clay: 2 to 8 percent
Calcium carbonate equivalent: 0 to 4 percent
SAR: 0 to 13
Rock fragments: 0 to 5 percent gravels
Reaction: slightly alkaline to strongly alkaline

Some pedons have a Bw horizon.

Councilor soils

Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torriorthents

Geomorphic position: occurs on stabilized dunes and sand sheets in dune fields

Parent material: eolian sands derived from sandstone over lacustrine deposits over residuum weathered from sandstone

Slope: 0 to 5 percent

Surface cover

Biological crust
-cyanobacteria: 0 percent
-lichen: 0 percent
-moss: 0 percent

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Chemical crust

-salt: 0 percent

-gypsum: 0 percent

Physical cover

-canopy plant cover: 45 percent

-woody debris: 5 percent

-bare soil: 60 percent

rock fragments: 0 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: 4.5 (low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very low

Hydrologic group: B

Ecological site name: Sandy Upland 10-14" p.z. Calcareous (CORA)

Ecological site number: R035XC373AZ

Present vegetation: broom snakeweed, *Ephedra*, galleta, Indian ricegrass

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Navajo Mountain Area, Arizona, Parts of Apache, Coconino, and Navajo Counties.

Location

Geographic Coordinate System: 36° 25' 54.10" north, 111° 23' 38.60" west

A—0 to 2 inches (0 to 5 cm); light brown (7.5YR 6/4) fine sand, brown (7.5YR 4/4), moist; 4 percent clay; moderate medium platy structure; slightly hard, very friable, nonsticky, nonplastic; many medium, very fine, and fine roots; many fine tubular and irregular pores; strongly effervescent, 12 percent calcium carbonate equivalent; neutral, pH 7.2; abrupt wavy boundary.

C1—2 to 13 inches (5 to 33 cm); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/4), moist; 8 percent clay; weak coarse platy parts to weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; few fine irregular and tubular pores; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear wavy boundary.

C2—13 to 18 inches (33 to 46 cm); pinkish white (7.5YR 8/2) fine sandy loam, brown (7.5YR 5/4), moist; 15 percent clay; weak coarse angular blocky parts to moderate fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few medium and very fine roots; few very fine irregular and tubular pores; common carbonate masses in matrix; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear irregular boundary.

C3—18 to 25 inches (46 to 64 cm); brown (7.5YR 5/4) fine sandy loam, strong brown (7.5YR 4/6), moist; 15 percent clay; weak very coarse subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; few very fine irregular and tubular pores; common carbonate masses in matrix; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

C4—25 to 35 inches (64 to 89 cm); pink (7.5YR 7/4) fine sand, strong brown (7.5YR 4/6), moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; many very

fine and fine roots; few very fine irregular and tubular pores; strongly effervescent, 12 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; abrupt wavy boundary.

C5—35 to 60 inches (89 to 152 cm); very pale brown (10YR 8/2) channery fine sand, light yellowish brown (10YR 6/4), moist; 3 percent clay; massive; hard, friable, nonsticky, nonplastic; few very fine and fine roots; few very fine irregular and tubular pores; 25 percent channer; slightly effervescent, 3 percent calcium carbonate equivalent; neutral, pH 7.2.

Range in Characteristics

Particle-size control section clay content: 3 to 12 percent

A horizon

Hue: 5YR, 7.5YR
Value: 4 to 6 dry, 3 to 5 moist
Chroma: 4 or 6, dry or moist
Texture: fine sand, sand
Clay: 3 to 7 percent
Calcium carbonate equivalent: 2 to 5 percent
SAR: 0 to 13
Reaction: neutral to moderately alkaline

C horizon

Hue: 5YR, 7.5YR, 10YR
Value: 4 to 8 dry, 3 to 6 moist
Chroma: 2 to 6, dry or moist
Texture: sandy loam, fine sandy loam, sand, fine sand, loamy fine sand
Clay: 3 to 18 percent
Calcium carbonate equivalent: 2 to 5 percent
SAR: 0 to 13
Rock fragments: 0 to 30 percent channers
Reaction: slightly alkaline to strongly alkaline

Mespun, limy substratum soils

Taxonomic classification: Siliceous, mesic Ustic Torripsamments

Geomorphic position: occur on stabilized dunes and sand sheets in dune fields

Parent material: eolian sands derived from Navajo 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: 55 percent
-woody debris: 5 percent
-bare soil: 55 percent
rock fragments: 0 percent

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: 4.2 (low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Soil Survey of Little Colorado River Area, Arizona

Runoff class: low

Hydrologic group: A

Ecological site name: Sandy Upland 10-14" p.z. Limy Subsurface

Ecological site number: R035XC375AZ

Present vegetation: blue grama, broom snakeweed, *Ephedra*, galleta

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Navajo Mountain Area, Arizona, Parts of Apache, Coconino, and Navajo Counties.

Location

Geographic Coordinate System: 36° 25' 38.10" north, 111° 24' 37.30" west

C1—0 to 4 inches (0 to 10 cm); strong brown (7.5YR 5/6) fine sand, brown (7.5YR 4/4), moist; 3 percent clay; single grain; loose, nonsticky, nonplastic; few very fine roots; few very fine tubular pores; noneffervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

C2—4 to 12 inches (10 to 30 cm); strong brown (7.5YR 5/6) fine sand, brown (7.5YR 4/4), moist; 4 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine and few fine roots; few very fine tubular pores; noneffervescent; moderately alkaline, pH 8.4; gradual wavy boundary.

C3—12 to 23 inches (30 to 58 cm); brown (7.5YR 4/4) fine sand, strong brown (7.5YR 4/6), moist; 5 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots; few very fine and fine tubular pores; noneffervescent; moderately alkaline, pH 8.0; gradual wavy boundary.

Cn1—23 to 40 inches (58 to 102 cm); light brown (7.5YR 6/3) fine sand, brown (7.5YR 4/4), moist; 7 percent clay; massive; moderately hard, friable, nonsticky, nonplastic; few fine roots; few very fine and fine tubular pores; strongly effervescent, 7 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear irregular boundary.

Cn2—40 to 60 inches (102 to 153 cm); pinkish white (7.5YR 8/2) fine sand, light brown (7.5YR 6/4), moist; 6 percent clay; massive; extremely hard, slightly rigid, nonsticky, nonplastic; few medium and fine roots; common fine tubular pores; violently effervescent, 15 percent calcium carbonate equivalent; strongly alkaline, pH 9.0.

Range in Characteristics

Particle-size control section clay content: 2 to 14 percent

C horizon

Hue: 5YR, 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 to 6, dry or moist

Texture: fine sand, sand, loamy sand, loamy fine sand

Clay: 2 to 14 percent

Calcium carbonate equivalent: 0 to 4 percent

SAR: 0 to 13

Rock fragments: 0 to 5 percent gravels

Reaction: slightly alkaline to moderately alkaline

Cn Horizon

Hue: 5YR, 7.5YR

Value: 4 to 8 dry, 5 to 7 moist

Chroma: 2 to 4, dry or moist

Texture: sand, fine sand, loamy sand, loamy fine sand

Clay: 2 to 14 percent
Calcium carbonate equivalent: 5 to 20 percent
SAR: 0 to 13
Rock fragments: 0 to 5 percent gravels
Reaction: moderately alkaline to strongly alkaline

31—Mido-Arches-Rock outcrop complex, 4 to 35 percent slopes

Map Unit Setting

Landform(s): plateaus
Elevation: 5,490 to 5,880 feet (1,673 to 1,792 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Mido and similar soils: 50 percent
Arches and similar soils: 30 percent
Rock outcrop: 10 percent
Minor Components: 10 percent
-Torriorthents soils that have bedrock deeper than 20 inches

Soil Properties and Qualities

Mido soils

Taxonomic classification: Mixed, mesic Ustic Torripsamments
Geomorphic position: occurs on sandsheets and stabilized dunes
Parent material: eolian sands derived from sandstone
Slope: 4 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: 20 percent
-woody debris: 0 percent
-bare soils: 80 percent
rock fragments: 0 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: 4.9 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: A

Soil Survey of Little Colorado River Area, Arizona

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

Ecological site number: R035XC315AZ

Present vegetation: *Ephedra*, blue grama, sand sagebrush, needle and thread, Indian ricegrass, galleta, *Sporobolus*, sandhill muhly

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 16' 46.40" north, 111° 13' 19.60" west

A—0 to 4 inches (0 to 10 cm); reddish brown (5YR 5/4) sand, reddish brown (5YR 4/4), moist; 4 percent clay; weak medium platy structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; common fine interstitial pores; slightly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual smooth boundary.

C1—4 to 49 inches (10 to 124 cm); reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4), moist; 5 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots; few fine tubular pores; common carbonate masses in matrix; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; gradual smooth boundary.

C2—49 to 60 inches (124 to 152 cm)); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 5/6), moist; 4 percent clay; single grain; loose, nonsticky, nonplastic; few fine roots; few fine vesicular pores; slightly effervescent, 3 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

Range in Characteristics

Particle-size control section clay content: 3 to 8 percent

A, C horizons

Hue: 7.5YR, 5YR

Value: 5 or 6 dry, 4 or 5 moist.

Chroma: 4 to 8, dry or moist

Texture: sand, fine sand, loamy sand, loamy fine sand

Clay: 3 to 8 percent

Calcium carbonate equivalent: 2 to 15 percent

Reaction: moderately alkaline to strongly alkaline

Some pedons are moderately deep to hard sandstone bedrock.

Arches soils

Taxonomic classification: Mixed, mesic Lithic Torripsamments

Geomorphic position: occurs on thin sandsheet accumulations on shoulders and backslopes of mesas

Parent material: eolian sands derived from sandstone

Slope: 15 to 35 percent

Surface cover

Biological crust

-cyanobacteria: 0 percent

-lichen: 0 percent

-moss: 0 percent

Chemical crust

-salt: 0 percent

-gypsum: 0 percent

Soil Survey of Little Colorado River Area, Arizona

Physical cover

- canopy plant cover: 20 percent
- woody debris: 0 percent
- bare soil: 80 percent
- rock fragments: 0 percent

Depth to restrictive feature(s): 10 to 20 inches to bedrock, lithic

Drainage class: excessively drained

Ksat solum: 5.95 to 19.98 inches per hour (42.00 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: 1.1 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very low

Hydrologic group: D

Ecological site name: Sandstone Hills 10-14" p.z.

Ecological site number: R035XC354AZ

Present vegetation: Bigelow sagebrush, Apache plume, *Ephedra*, Colorado pinyon, blue grama

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 15' 16.10" north, 111° 14' 29.90" west

C1—0 to 3 inches (0 to 8 cm); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 5/6), moist; 4 percent clay; single grain; loose, nonsticky, nonplastic; common medium and few fine roots; few fine interstitial pores; noneffervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—3 to 19 inches (8 to 48 cm); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 5/6), moist; 4 percent clay; massive; soft, very friable, nonsticky, nonplastic; few fine roots; few very fine tubular pores; very slightly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

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

Range in Characteristics

Particle-size control section clay content: 3 to 7 percent

C horizon

Hue: 7.5YR, 5YR

Value: 5 or 6, dry or moist.

Chroma: 6, dry or moist

Texture: sand, fine sand, loamy fine sand

Clay: 3 to 7 percent

Calcium carbonate equivalent: 0 to 5 percent

SAR: 0 to 4

Reaction: moderately alkaline

Rock outcrop

Slope: 15 to 35 percent

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.

32—Mido-Arches-Ustic Haplocalcids complex, 2 to 10 percent slopes

Map Unit Setting

Landform(s): mesas

Elevation: 5,400 to 5,700 feet (1,646 to 1,737 meters)

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)

Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Mido and similar soils: 50 percent

Arches and similar soils: 20 percent

Ustic Haplocalcids and similar soils: 20 percent

Minor components: 10 percent

-Rock outcrop

-Ustic Torrifuvents and similar soils

Soil Properties and Qualities

Mido soils

Taxonomic classification: Mixed, mesic Ustic Torrripsamments

Geomorphic position: occurs on stabilized dunes and sand sheets in dune fields

Parent material: eolian sands derived from sandstone and/or colluvium derived from sandstone

Slope: 2 to 10 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: 30 percent

-woody debris: 3 percent

-bare soil: 75 percent

rock fragments: 0 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: 4.2 (low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: low

Hydrologic group: A

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

Ecological site number: R035XC315AZ

Present vegetation: blackbrush, *Ephedra*, Utah juniper

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Navajo Mountain Area, Arizona, Parts of Apache, Coconino, and Navajo Counties.

Location

Geographic Coordinate System: 36° 20' 7.40" north, 111° 23' 17.60" west

A—0 to 3 inches (0 to 8 cm); strong brown (7.5YR 5/6) sand, strong brown (7.5YR 4/6), moist; 3 percent clay; weak medium subangular blocky structure; soft, loose, nonsticky, nonplastic; common very fine and fine roots; common very fine and fine tubular pores; noneffervescent; neutral, pH 7.2; gradual smooth boundary.

C1—3 to 10 inches (8 to 25 cm); yellowish red (5YR 4/6) sand, reddish brown (5YR 4/4), moist; 3 percent clay; massive; soft, loose, nonsticky, nonplastic; common very fine and fine roots; common very fine and fine tubular pores; 5 percent gravel; noneffervescent; slightly alkaline, pH 7.4; gradual smooth boundary.

C2—10 to 24 inches (25 to 61 cm); yellowish red (5YR 5/8) sand, reddish brown (5YR 4/4), moist; 5 percent clay; massive; soft, loose, nonsticky, nonplastic; common very fine to medium roots; few very fine and fine tubular pores; violently effervescent, 16 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; clear wavy boundary.

C3—24 to 60 inches (61 to 153 cm); yellowish red (5YR 5/6) gravelly sand, yellowish red (5YR 4/6), moist; 4 percent clay; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots; common very fine to medium tubular pores; 15 percent gravel; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Range in Characteristics

Rock fragments of the control section: 5 to 13 percent gravels

Particle-size control section clay content: 3 to 6 percent

A, C horizons

Hue: 5YR, 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 to 8, dry or moist

Texture: fine sand, sand, loamy fine sand, loamy sand

Clay: 2 to 7 percent

Calcium carbonate equivalent: 0 to 25 percent

Rock fragments: 0 to 20 percent gravels

Reaction: neutral to strongly alkaline

Some pedons have a Cn horizon that is strongly alkaline.

Arches soils

Taxonomic classification: Mixed, mesic Lithic Torripsamments

Geomorphic position: occurs on structural benches and ledges on mesa escarpments

Parent material: eolian sands derived from sandstone

Slope: 2 to 10 percent

Surface cover

Biological crust

-cyanobacteria: 5 percent

-lichen: 0 percent

-moss: 0 percent

Chemical crust

-salt: 0 percent

-gypsum: 0 percent

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Physical cover

- canopy plant cover: 35 percent
- woody debris: 3 percent
- bare soil: 65 percent
- rock fragments
- gravel: 5 percent

Depth to restrictive feature(s): 5 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: 0.9 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: low

Hydrologic group: D

Ecological site name: Sandstone Upland 10-14" p.z.

Ecological site number: R035XC314AZ

Present vegetation: blackbrush, *Ephedra*

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Navajo Mountain Area, Arizona, Parts of Apache, Coconino, and Navajo Counties.

Location

Geographic Coordinate System: 36° 21' 7.20" north, 111° 24' 30.10" west

C1—0 to 3 inches (0 to 8 cm); reddish brown (5YR 5/4) sand, reddish brown (5YR 4/4), moist; 5 percent clay; single grain; loose, nonsticky, nonplastic; few very fine roots; few very fine and fine tubular pores; noneffervescent; slightly alkaline, pH 7.6; abrupt wavy boundary.

C2—3 to 14 inches (8 to 36 cm); red (2.5YR 5/6) loamy sand, red (2.5YR 4/6), moist; 8 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots; few very fine and fine tubular pores; noneffervescent; slightly alkaline, pH 7.4; abrupt wavy boundary.

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

Range in Characteristics

Particle-size control section clay content: 4 to 8 percent

C horizon

Hue: 2.5YR, 5YR, 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 4 or 6, dry or moist

Texture: sand, loamy sand, fine sand

Clay: 3 to 9 percent

Calcium carbonate equivalent: 0 to 4 percent

Rock fragments: 0 to 5 percent gravels

Reaction: neutral to moderately alkaline

Ustic Haplocalcids soils

Taxonomic classification: Ustic Haplocalcids

Geomorphic position: occurs on sand sheets on mesa summits

Parent material: eolian sands derived from sandstone over lacustrine deposits

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Slope: 2 to 10 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: 3 percent

-bare soil: 65 percent

rock fragments

gravel: 5 percent

Depth to restrictive feature(s): 20 to 60 inches to bedrock, densic

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: 1.5 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: low

Hydrologic group: C

Ecological site name: Sandy Upland 10-14" p.z. Calcareous (CORA)

Ecological site number: R035XC373AZ

Present vegetation: blackbrush, *Ephedra*

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Navajo Mountain Area, Arizona, Parts of Apache, Coconino, and Navajo Counties.

Location

Geographic Coordinate System: 36° 20' 42.00" north, 111° 23' 51.10" west

C1—0 to 4 inches (0 to 10 cm); yellowish red (5YR 5/6) sand, dark reddish brown (5YR 3/4), moist; 5 percent clay; single grain; loose, nonsticky, nonplastic; few very fine and fine roots; common very fine irregular pores; noneffervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C2—4 to 18 inches (10 to 46 cm); red (2.5YR 4/6) loamy sand, dark reddish brown (2.5YR 3/4), moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; few very fine and fine tubular pores; noneffervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Bk—18 to 25 inches (46 to 64 cm); yellowish red (5YR 5/6) gravelly sandy loam, yellowish red (5YR 4/6), moist; 12 percent clay; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; few very fine and fine irregular pores; common carbonate masses in matrix; 15 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear wavy boundary.

2Cd—25 to 60 inches (64 to 152 cm); white (10YR 8/1) sandy loam, light gray (10YR 7/2), moist; 13 percent clay; massive; hard, friable, cemented by carbonates, slightly sticky, slightly plastic; few very fine irregular pores; violently effervescent; strongly alkaline, pH 8.8.

Range in Characteristics

Ustic Haplocalcids have soil properties that vary outside of family class limits.

Particle-size control section clay content: 6 to 14 percent

C horizon

Hue: 2.5YR, 5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 4 or 6, dry or moist

Texture: loamy sand, sandy loam, fine sand, sand

Clay: 4 to 10 percent

Rock fragments: 0 to 5 percent gravels

Reaction: neutral to moderately alkaline

Bk horizon

Hue: 2.5YR, 5YR, 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 4 or 6, dry or moist

Texture: sandy loam, loam

Clay: 9 to 17 percent

Calcium carbonate equivalent: 5 to 15 percent

Rock fragments: 10 to 23 percent gravels

Reaction: strongly alkaline

2Cd Horizon

Hue: 5YR, 10YR

Value: 6 to 8 dry, 5 to 7 moist

Chroma: 1 to 3, dry or moist

Texture: sandy loam, loam, sand

Clay: 7 to 15 percent

Calcium carbonate equivalent: 0 to 15 percent

Rock fragments: 0 to 5 percent gravels

Reaction: strongly alkaline

Calcic horizon: the zone from 18 to 25 inches (46 to 64 cm), (Bk horizon)

33—Moffat-Monue complex, 1 to 6 percent slopes

Map Unit Setting

Landform(s): plateaus, sand sheets

Elevation: 4,800 to 5,900 feet (1,463 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 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Moffat and similar soils: 45 percent

Monue and similar soils: 40 percent

Minor Components: 15 percent

-Sheppard and similar soils

-Typic Haplocambids and similar soils

-Jeddito and similar soils

Soil Properties and Qualities

Moffat soils

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocalcids

Geomorphic position: occurs on sandsheets on plateaus

Parent material: eolian sands

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: 10 percent

-woody debris: 5 percent

-bare soil: 85 percent

rock fragments

gravel: 2 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: 5.5 (moderate)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: low

Hydrologic group: B

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

Ecological site number: R035XB219AZ

Present vegetation: *Ephedra*, galleta, Indian ricegrass, Russian thistle, sand sagebrush, winterfat

Land capability (irrigated): 3e

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 21' 43.10" north, 110° 53' 24.50" west

C—0 to 2 inches (0 to 5 cm); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6), moist; 7 percent clay; massive; soft, very friable, nonsticky, nonplastic; common fine roots; many very fine interstitial pores; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk1—2 to 10 inches (5 to 25 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 17 percent clay; weak medium subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; common fine roots; common very fine and fine irregular pores; few carbonate masses in matrix; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk2—10 to 17 inches (25 to 43 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 18 percent clay; weak medium subangular blocky structure; slightly hard, friable, very sticky, very plastic; common very fine roots; many very fine tubular pores; common carbonate masses in matrix; strongly effervescent,

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15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk3—17 to 41 inches (43 to 104 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 16 percent clay; massive; soft, very friable, moderately sticky, moderately plastic; common very fine roots; common fine irregular pores; common carbonate masses in matrix; violently effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual smooth boundary.

C—41 to 60 inches (104 to 152 cm); reddish yellow (5YR 6/6) sand, reddish brown (5YR 5/4), moist; 5 percent clay; massive; loose, nonsticky, nonplastic; common very fine roots; common fine irregular pores; common carbonate, finely disseminated; 2 percent gravel; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

Range in Characteristics

Particle-size control section clay content: 4 to 18 percent

C horizon

Hue: 5YR, 2.5YR
Value: 5 or 6 dry, 3 or 4 moist
Chroma: 4 or 6, dry or moist
Texture: loamy fine sand, loamy sand
Clay: 4 to 14 percent
Calcium carbonate equivalent: 2 to 10 percent
Reaction: moderately alkaline

Bk horizon

Hue: 5YR, 2.5YR
Value: 5 or 6 dry, 3 or 4 moist
Chroma: 4 or 6, dry or moist
Texture: fine sandy loam, sandy loam
Clay: 4 to 18 percent
Calcium carbonate equivalent: 2 to 15 percent
Reaction: moderately alkaline

C horizon

Hue: 5YR, 2.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: sand, loamy sand, loamy fine sand
Clay: 4 to 14 percent
Calcium carbonate equivalent: 2 to 10 percent
Rock fragments: 0 to 5 percent gravels
Reaction: moderately alkaline

Cambic horizon: the zone from 2 to 10 inches (5 to 25 cm), (Bk1 horizon)

Calcic horizon: the zone from 10 to 41 inches (25 to 104 cm), (Bk2, Bk3 horizons)

Some pedons have a slight accumulation of sodium in the Bw horizon.

Monue soils

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids

Geomorphic position: occurs on sandsheets on plateaus

Parent material: eolian sands

Slope: 1 to 6 percent

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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
- rock fragments: 0 percent

Drainage class: somewhat excessively drained

Ksat solum: 0.57 to 5.95 inches per hour (4.00 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: B

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

Ecological site number: R035XB219AZ

Present vegetation: black grama, James' galleta, Russian thistle, winterfat

Land capability (irrigated): 3e

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 28' 7.00" north, 110° 36' 43.90" west

A—0 to 6 inches (0 to 15 cm); yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4), moist; 5 percent clay; fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; common fine irregular pores; slightly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

Bw—6 to 26 inches (15 to 65 cm); yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4), moist; 7 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common medium, very fine, and fine roots; common fine irregular pores; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

C—26 to 60 inches (65 to 152 cm); light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4), moist; 10 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; common very fine roots; common fine interstitial pores; common carbonate, finely disseminated; violently effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

Range in Characteristics

Particle-size control section clay content: 6 to 16 percent

A horizon

Hue: 5YR, 2.5YR

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 4 or 6, dry or moist

Texture: fine sandy loam, loamy fine sand

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Clay: 2 to 10 percent
Reaction: moderately alkaline

Bw horizon

Hue: 5YR, 2.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: fine sandy loam, sandy loam
Clay: 6 to 16 percent
Calcium carbonate equivalent: 2 to 10 percent
Reaction: moderately alkaline

C horizon

Hue: 5YR, 2.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: fine sandy loam, sandy loam
Clay: 6 to 16 percent
Calcium carbonate equivalent: 10 to 15 percent
Reaction: moderately alkaline to strongly alkaline

Cambic horizon: the zone from 6 to 26 inches (15 to 66 cm), (Bw horizon)

Some pedons have a slight accumulation of sodium in the Bw horizon.

34—Moffat-Sheppard complex, 1 to 6 percent slopes

Map Unit Setting

Landform(s): fan terraces

Elevation: 5,100 to 5,600 feet (1,554 to 1,707 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Moffat and similar soils: 60 percent

Sheppard and similar soils: 25 percent

Minor Components: 15 percent

-Loamy Typic Torriorthents and similar soils

-Fine-loamy Typic Haplocalcids and similar soils

-Fine-loamy Typic Haplocambids and similar soils

Soil Properties and Qualities

Moffat soils

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocalcids

Geomorphic position: occurs on summits on fan terraces

Parent material: eolian sands over alluvium derived from sandstone and siltstone

Slope: 1 to 6 percent

Surface cover:

Biological crust

-cyanobacteria: 0 percent

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-lichen: 0 percent
-moss: 0 percent
Chemical crust
-salt: 0 percent
-gypsum: 0 percent
Physical cover
-canopy plant cover: 45 percent
-woody debris: 10 percent
-bare soil: 45 percent
rock fragments: 0 percent
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: 5.2 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: very low
Hydrologic group: A
Ecological site name: Sandy Loam Upland 6-10" p.z. Calcareous
Ecological site number: R035XB235AZ
Present vegetation: blackbrush, Indian ricegrass, galleta, black grama, blue grama, sand dropseed
Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 33' 58.85" north, 111° 37' 28.20" west

A—0 to 2 inches (0 to 5 cm); yellowish red (5YR 4/6) loamy fine sand, dark reddish brown (5YR 3/4), moist; 6 percent clay; moderate coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine roots; common very fine irregular pores; noneffervescent; slightly alkaline, pH 7.8; clear wavy boundary.

Bw—2 to 7 inches (5 to 18 cm); red (2.5YR 4/8) loamy fine sand, dark red (2.5YR 3/6), moist; 10 percent clay; moderate coarse and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and few fine roots; common very fine irregular pores; common gypsum masses in matrix; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; clear irregular boundary.

Bk—7 to 23 inches (18 to 58 cm); red (2.5YR 4/8) fine sandy loam, dark red (2.5YR 3/6), moist; 14 percent clay; moderate coarse subangular blocky structure; moderately hard, friable, slightly sticky, slightly plastic; few very fine roots; common very fine irregular pores; many carbonate masses in matrix; strongly effervescent, 8 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

Bkn1—23 to 35 inches (58 to 89 cm); red (2.5YR 5/6) fine sandy loam, dark red (2.5YR 3/6), moist; 10 percent clay; moderate coarse subangular blocky structure; moderately hard, friable, slightly sticky, slightly plastic; few very fine roots; common very fine irregular pores; very few carbonate concretions on bottom of rock fragments; few carbonate masses in matrix; 3 percent gravel; strongly effervescent, 6 percent calcium carbonate equivalent; strongly alkaline, pH 8.9; clear smooth boundary.

Bkn2—35 to 40 inches (89 to 102 cm); red (2.5YR 5/6) fine sandy loam, dark red (2.5YR 3/6), moist; 9 percent clay; moderate coarse and medium subangular blocky structure; very hard, friable, slightly sticky, slightly plastic; few very fine roots; common very fine irregular pores; very few carbonate concretions on bottom of rock fragments;

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common carbonate nodules in matrix and common carbonate, finely disseminated; 10 percent gravel; violently effervescent, 9 percent calcium carbonate equivalent; strongly alkaline, pH 8.9; clear smooth boundary.

Bkn3—40 to 46 inches (102 to 117 cm); red (2.5YR 5/6) loamy sand, dark red (2.5YR 3/6), moist; 7 percent clay; moderate medium subangular blocky structure; very hard, friable, slightly sticky, slightly plastic; few very fine roots; common very fine irregular pores; very few carbonate concretions on bottom of rock fragments; common carbonate nodules in matrix and common carbonate, finely disseminated; 5 percent gravel; strongly effervescent, 8 percent calcium carbonate equivalent; strongly alkaline, pH 9.0; clear smooth boundary.

Bkn4—46 to 60 inches (117 to 152 cm); red (2.5YR 4/8) loamy sand, dark red (2.5YR 3/6), moist; 7 percent clay; moderate medium subangular blocky structure; very hard, friable, slightly sticky, slightly plastic; few very fine roots; common very fine irregular pores; very few carbonate concretions on bottom of rock fragments; common carbonate nodules in matrix; 3 percent gravel; slightly effervescent, 5 percent calcium carbonate equivalent; very strongly alkaline, pH 9.1; clear smooth boundary.

Range in Characteristics

Rock fragments of the control section: 0 to 6 percent gravels

Particle-size control section clay content: 9 to 15 percent

A horizon

Hue: 5YR, 7.5YR

Value: 4 or 5 dry, 3 to 5 moist

Chroma: 4 to 6, dry or moist

Texture: loamy fine sand

Clay: 2 to 6 percent

Rock fragments: 0 to 5 percent gravels

Reaction: slightly alkaline to moderately alkaline

Bw horizon

Hue: 2.5YR, 5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 6 or 8, dry or moist

Texture: loamy fine sand, loamy sand, fine sandy loam, sandy loam

Clay: 8 to 18 percent

Calcium carbonate equivalent: 0 to 2 percent

Rock fragments: 0 to 5 percent gravels

Reaction: moderately alkaline

Bk horizon

Hue: 2.5YR, 5YR, 7.5YR

Value: 4 to 7 dry, 3 to 5 moist

Chroma: 4 to 8, dry or moist

Texture: fine sandy loam, sandy loam

Clay: 10 to 16 percent

Calcium carbonate equivalent: 5 to 15 percent

SAR: 0 to 4

Rock fragments: 0 to 5 percent gravels

Reaction: strongly alkaline

Bkn horizon

Hue: 2.5YR, 5YR, 7.5YR

Value: 4 to 8 dry, 3 to 7 moist

Chroma: 4 to 8, dry or moist

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Texture: fine sandy loam, sandy loam, loamy fine sand, loamy sand
Clay: 6 to 16 percent
Calcium carbonate equivalent: 5 to 15 percent
SAR: 2 to 12
EC: 0 to 2
Rock fragments: 0 to 15 percent gravels
Reaction: strongly alkaline to very strongly alkaline

Calcic horizon: the zone from 7 to 46 inches (18 to 117 cm), (Bk and Bkn horizons)

Sheppard soils

Taxonomic classification: Mixed, mesic Typic Torripsamments

Geomorphic position: occurs on backslopes on fan terraces

Parent material: eolian sands over alluvium derived from sandstone and siltstone

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: 10 percent

-bare soil: 55 percent

rock fragments: 0 percent

Drainage class: somewhat excessively drained

Ksat solum: 1.98 to 99.92 inches per hour (14.00 to 705.00 micrometers per second)

Available water capacity total inches: 4.7 (low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: negligible

Hydrologic group: A

Ecological site name: Sandy Upland 6-10" p.z.

Ecological site number: R035XB217AZ

Present vegetation: Indian ricegrass, sand dropseed, rubber rabbitbrush, *Ephedra*, Whipple cholla, narrowleaf yucca

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 38' 30.30" north, 111° 38' 47.37" west

C1—0 to 1 inches (0 to 1 cm); reddish yellow (7.5YR 6/6) sand, strong brown (7.5YR 4/6), moist; 2 percent clay; single grain; loose, nonsticky, nonplastic; few very fine and medium roots; common fine interstitial pores; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

C2—1 inch to 5 inches (1 to 13 cm); strong brown (7.5YR 5/6) sand, strong brown (7.5YR 4/6), moist; 4 percent clay; weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few very fine and medium roots; few fine irregular pores; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

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C3—5 to 23 inches (13 to 58 cm); yellowish red (5YR 5/6) sand, yellowish red (5YR 4/6), moist; 4 percent clay; weak very coarse and coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common very fine and few fine and medium roots; few fine irregular pores; noneffervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C4—23 to 45 inches (58 to 113 cm); yellowish red (5YR 5/6) sand, yellowish red (5YR 4/6), moist; 4 percent clay; weak coarse and very coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots; few fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

2Ck1—45 to 49 inches (113 to 124 cm); red (2.5YR 4/6) sandy loam, dark red (2.5YR 3/6), moist; 10 percent clay; moderate coarse and medium subangular blocky structure; moderately hard, very friable, slightly sticky, nonplastic; few very fine and fine roots; few very fine irregular pores; few carbonate masses in matrix; 2 percent gravel; strongly effervescent, 5 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; abrupt smooth boundary.

2Ck2—49 to 60 inches (124 to 152 cm); pink (5YR 7/4) sandy loam, light reddish brown (5YR 6/4), moist; 16 percent clay; massive; soft, very friable, moderately sticky, moderately plastic; few very fine and fine roots; few very fine irregular pores; common carbonate masses in matrix; 5 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent; strongly alkaline, pH 8.7.

Range in Characteristics

Particle-size control section clay content: 1 to 4 percent

C horizon

Hue: 5YR, 7.5YR

Value: 5 or 6 dry, 4 moist

Chroma: 6, dry or moist

Texture: sand, loamy sand, loamy fine sand

Clay: 1 to 4 percent

Reaction: slightly alkaline to moderately alkaline

2Ck horizon

Hue: 2.5YR, 5YR

Value: 4 or 7 dry, 3 or 6 moist

Chroma: 4 or 6, dry or moist

Texture: sandy loam, fine sandy loam

Clay: 6 to 16 percent

Calcium carbonate equivalent: 5 to 15 percent

Rock fragments: 0 to 10 percent gravels

Reaction: slightly alkaline to strongly alkaline

35—Navajo-Jocity complex, 1 to 3 percent slopes

Map Unit Setting

Landform(s): playas, stream terraces

Elevation: 4,690 to 5,090 feet (1,430 to 1,550 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Soil Survey of Little Colorado River Area, Arizona

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

Map Unit Composition

Navajo and similar soils: 60 percent
Jocity and similar soils: 30 percent
Minor Components: 10 percent
-Joraibi and similar soils
-Ives and similar soils
-Tours and similar soils
-Playa areas considered similar to Navajo Soils

Soil Properties and Qualities

Navajo soils

Taxonomic classification: Fine, mixed, superactive, calcareous, mesic Vertic
Torrifluvents

Geomorphic position: occurs on playas

Parent material: alluvium 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: 5 percent
- woody debris: 2 percent
- bare soil: 93 percent
- rock fragments: 0 percent

Drainage class: well drained

Ksat solum: 0.06 to 0.20 inches per hour (0.42 to 1.40 micrometers per second)

Available water capacity total inches: 10.0 (high)

Shrink-swell potential: about 10.5 LEP (very high)

Flooding hazard: occasional

Runoff class: high

Hydrologic group: C

Ecological site name: Loamy Wash 6-10" p.z. Saline

Ecological site number: R035XB211AZ

Present vegetation: mound saltbush, Bailey greasewood, alkali sacaton, Russian
thistle

Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 35° 14' 32.80" north, 110° 53' 51.80" west

A—0 to 2 inches (0 to 5 cm); reddish brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4), moist; 45 percent clay; weak thin platy structure; hard, friable, very sticky, very plastic; common very fine and fine roots; common very fine vesicular pores; violently effervescent, 5 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual smooth boundary.

Soil Survey of Little Colorado River Area, Arizona

Cky—2 to 7 inches (5 to 18 cm); reddish brown (2.5YR 4/4) silty clay, dark reddish brown (2.5YR 3/4), moist; 42 percent clay; weak medium prismatic structure; hard, firm, very sticky, very plastic; common very fine and fine roots; common very fine tubular pores; common carbonate masses in matrix and common gypsum masses in matrix; violently effervescent, 5 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.4; gradual smooth boundary.

Ckssy—7 to 34 inches (18 to 86 cm); reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4), moist; 48 percent clay; moderate fine angular blocky structure; hard, firm, very sticky, very plastic; few very fine roots; common very fine tubular pores; few slickensides and few pressure faces; common carbonate masses in matrix and common gypsum masses in matrix; violently effervescent, 5 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.4; gradual smooth boundary.

C'ky—34 to 60 inches (86 to 152 cm); reddish brown (2.5YR 5/3) clay loam, reddish brown (2.5YR 4/3), moist; 39 percent clay; moderate thick platy structure; hard, firm, very sticky, very plastic; few very fine roots; common very fine tubular pores; common carbonate masses in matrix and common gypsum masses in matrix; violently effervescent, 5 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.2.

Range in Characteristics

Particle-size control section clay content: 40 to 48 percent

A horizon

Hue: 2.5YR, 5YR
Value: 4 to 6 dry, 3 or 4 moist
Chroma: 3 or 4, dry or moist
Texture: silty clay, clay
Clay: 40 to 50 percent
Calcium carbonate equivalent: 2 to 10 percent
SAR: 0 to 4
Reaction: moderately alkaline to strongly alkaline

Ckssy, Cky horizons

Hue: 2.5YR, 5YR
Value: 3 to 5, dry or moist
Chroma: 3 or 4, dry or moist
Texture: clay, silty clay, clay loam
Clay: 35 to 50 percent
Calcium carbonate equivalent: 2 to 10 percent
Gypsum: 0 to 4 percent
Reaction: moderately alkaline to strongly alkaline

Slickenslides: slickenslides from 7 to 34 inches (18 to 86 cm), (Ckssy horizon).

Vertic: surface cracking with 1-inch (3 cm)-wide cracks 3 inches (8 cm) deep across the soil surface.

Jocity soils

Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic Torrifuvents

Geomorphic position: occurs on stream terraces

Parent material: alluvium derived from sandstone and shale

Slope: 1 to 3 percent

Soil Survey of Little Colorado River Area, Arizona

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
- rock fragments: 0 percent

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: 8.0 (high)

Shrink-swell potential: about 7.5 LEP (high)

Flooding hazard: rare

Runoff class: medium

Hydrologic group: C

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

Ecological site number: R035XB216AZ

Present vegetation: rubber rabbitbrush, fourwing saltbush, Bailey greasewood, saltcedar, annual sunflower, Russian thistle

Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System: 35° 14' 52.70" north, 110° 53' 51.50" west

A—0 to 2 inches (0 to 5 cm); reddish brown (2.5YR 5/3) silty clay loam, reddish brown (2.5YR 4/3), moist; 35 percent clay; moderate very fine granular structure; hard, firm, very sticky, very plastic; common very fine and fine roots; common very fine vesicular pores; strongly effervescent, 5 percent calcium carbonate equivalent; strongly alkaline, pH 9.0; abrupt smooth boundary.

C—2 to 7 inches (5 to 18 cm); reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4), moist; 45 percent clay; moderate medium prismatic structure; hard, firm, very sticky, very plastic; common very fine roots; common very fine tubular pores; violently effervescent, 5 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual smooth boundary.

C_{ky}—7 to 18 inches (18 to 46 cm); reddish brown (2.5YR 4/4) silty clay loam, dark reddish brown (2.5YR 3/4), moist; 35 percent clay; moderate thick platy structure; hard, firm, very sticky, very plastic; common very fine roots; common very fine and fine tubular pores; common carbonate masses in matrix and common gypsum masses in matrix; violently effervescent, 5 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.4; abrupt smooth boundary.

C'—18 to 23 inches (46 to 58 cm); light reddish brown (5YR 6/3) silt loam, reddish brown (5YR 5/3), moist; 23 percent clay; moderate thin platy structure; slightly hard, friable, very sticky, slightly plastic; few very fine roots; common very fine irregular pores; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; gradual smooth boundary.

Soil Survey of Little Colorado River Area, Arizona

C_{ky}—23 to 41 inches (58 to 104 cm); light reddish brown (5YR 6/3) fine sandy loam, reddish brown (5YR 5/3), moist; 11 percent clay; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; common very fine irregular pores; common gypsum masses in matrix and common carbonate masses in matrix; violently effervescent, 2 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.4; gradual smooth boundary.

C_”—41 to 60 inches (104 to 152 cm); light reddish brown (5YR 6/3) loamy fine sand, reddish brown (5YR 5/3), moist; 8 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; common very fine irregular pores; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

Range in Characteristics

Particle-size control section clay content: 18 to 22 percent

A horizon

Hue: 2.5YR, 5YR
Value: 4 or 5 dry, 3 or 4 moist
Chroma: 3 or 4, dry or moist
Texture: silty clay loam
Clay: 30 to 40 percent
Calcium carbonate equivalent: 2 to 10 percent
SAR: 0 to 4
Reaction: moderately alkaline to strongly alkaline

C horizon

Hue: 2.5YR, 5YR
Value: 4 to 6, dry or moist
Chroma: 3 to 5, dry or moist
Texture: clay, silty clay loam, silt loam, fine sandy loam, loamy fine sand
Clay: 5 to 45 percent
Calcium carbonate equivalent: 2 to 10 percent
Gypsum: 0 to 4 percent
SAR: 0 to 4
Reaction: moderately alkaline to strongly alkaline

36—Needle-Rock outcrop-Sheppard complex, 2 to 15 percent slopes

Map Unit Setting

Landform(s): plateaus, sand sheets, structural benches
Elevation: 4,890 to 5,790 feet (1,492 to 1,764 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Needle and similar soils: 35 percent
Rock outcrop: 30 percent
Sheppard and similar soils: 25 percent
Minor Components: 10 percent

- Monue and similar soils
- Lithic Torriorthents

Soil Properties and Qualities

Needle soils

Taxonomic classification: Mixed, mesic Lithic Torripsamments

Geomorphic position: occurs on shallow sand sheets overlying sandstone

Parent material: eolian sands derived from sandstone over residuum weathered from sandstone

Slope: 4 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: 10 percent

-woody debris: 1 percent

-bare soil: 89 percent

rock fragments: 0 percent

Depth to restrictive feature(s): 8 to 19 inches to bedrock, lithic

Drainage class: excessively drained

Ksat solum: 5.95 to 19.98 inches per hour (42.00 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: 1.1 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very low

Hydrologic group: D

Ecological site name: Sandstone Upland 6-10" p.z. Calcareous

Ecological site number: R035XB230AZ

Present vegetation: blackbrush, Indian ricegrass, wavyleaf oak

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 9' 55.50" north, 111° 13' 41.20" west

C1—0 to 2 inches (0 to 5 cm); yellowish red (5YR 5/8) loamy fine sand, yellowish red (5YR 4/6), moist; 5 percent clay; massive; loose, very friable, nonsticky, nonplastic; many very fine and common fine roots; common fine interstitial pores; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; gradual smooth boundary.

C2—2 to 11 inches (5 to 28 cm); yellowish red (5YR 5/8) loamy fine sand, yellowish red (5YR 4/6), moist; 5 percent clay; massive; loose, very friable, nonsticky, nonplastic; common very fine and fine roots; common very fine and fine interstitial pores; noneffervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

R—11 inches (28 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Particle-size control section clay content: 2 to 7 percent

C horizon

Hue: 5YR

Value: 4 or 5, dry or moist

Chroma: 6 or 8, dry or moist

Texture: loamy fine sand, fine sand

Clay: 2 to 7 percent

Calcium carbonate equivalent: 0 to 2 percent

Reaction: slightly alkaline to strongly alkaline

Rock outcrop

Slope: 15 to 25 percent

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.

Sheppard soils

Taxonomic classification: Mixed, mesic Typic Torripsamments

Geomorphic position: occurs on moderately deep to very deep sand dunes and sand sheets overlying sandstone

Parent material: eolian sands derived from sandstone

Slope: 2 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: 10 percent

-woody debris: 1 percent

-bare soil: 89 percent

rock fragments: 0 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: 5.9 (moderate)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very low

Hydrologic group: A

Ecological site name: Sandy Upland 6-10" p.z.

Ecological site number: R035XB217AZ

Present vegetation: sand sagebrush, broom snakeweed, *Ephedra*, rosemary mint, sandhill muhly, Indian ricegrass, narrowleaf yucca, sand dropseed

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 9' 53.30" north, 111° 13' 53.00" west

C1—0 to 2 inches (0 to 5 cm); yellowish red (5YR 5/8) fine sand, yellowish red (5YR 4/6), moist; 3 percent clay; single grain; loose, nonsticky, nonplastic; common fine

roots; common very fine interstitial pores; noneffervescent; moderately alkaline, pH 8.0; gradual smooth boundary.

C2—2 to 60 inches (5 to 152 cm); yellowish red (5YR 5/8) loamy fine sand, yellowish red (5YR 4/6), moist; 5 percent clay; massive; loose, very friable, nonsticky, nonplastic; common fine roots; common very fine interstitial pores; noneffervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Particle-size control section clay content: 2 to 7 percent

C horizon

Hue: 5YR

Value: 4 or 5, dry or moist

Chroma: 6 or 8, dry or moist

Texture: loamy fine sand, fine sand

Clay: 2 to 7 percent

Calcium carbonate equivalent: 0 to 2 percent

Reaction: moderately alkaline

37—Nepalto family-Tsaya-Rock outcrop complex, 35 to 70 percent slopes

Map Unit Setting

Landform(s): cliffs, escarpments, talus slopes

Elevation: 3,200 to 6,200 feet (975 to 1,890 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Nepalto family and similar soils: 35 percent

Tsaya and similar soils: 30 percent

Rock outcrop: 20 percent

Minor Components: 15 percent

-Loamy-skeletal Typic Haplocalcids and similar soils

-Loamy-skeletal Typic Calciargids and similar soils

-Rubble land

-Badland

Soil Properties and Qualities

Nepalto family soils

Taxonomic classification: Sandy-skeletal, mixed, mesic Typic Torriorthents

Geomorphic position: occurs on talus slopes

Parent material: colluvium derived from sandstone

Slope: 35 to 70 percent

Surface cover:

Biological crust

-cyanobacteria: 0 percent

Soil Survey of Little Colorado River Area, Arizona

-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
rock fragments
 gravel: 10 percent
 cobble: 25 percent
 stone: 25 percent
 boulder: 10 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: 3.0 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: A
Ecological site name: Stony Slopes 6-10" p.z. Calcareous
Ecological site number: R035XB236AZ
Present vegetation: Indian ricegrass, galleta, *Ephedra*, black grama, blackbrush
Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 50' 55.97" north, 111° 35' 11.29" west

C1—0 to 4 inches (0 to 10 cm); yellowish red (5YR 5/6) extremely stony loamy fine sand, yellowish red (5YR 4/6), moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; many very fine irregular pores; 25 percent gravel, 25 percent cobble, 25 percent stone, and 2 percent boulder; strongly effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

C2—4 to 12 inches (10 to 30 cm); yellowish red (5YR 5/6) extremely cobbly loamy fine sand, yellowish red (5YR 4/6), moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; few very fine tubular and common very fine irregular pores; 45 percent gravel, 25 percent cobble, and 10 percent stone; strongly effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

C3—12 to 24 inches (30 to 61 cm); yellowish red (5YR 5/6) extremely cobbly loamy fine sand, yellowish red (5YR 4/6), moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; few very fine and fine tubular and common very fine and fine irregular pores; 35 percent gravel, 25 percent cobble, and 10 percent stone; strongly effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear smooth boundary.

C4—24 to 60 inches (61 to 152 cm); yellowish red (5YR 5/6) extremely stony loamy fine sand, yellowish red (5YR 4/6), moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; 5 percent gravel, 25 percent cobble, 35 percent stone, and 20 percent boulder; strongly effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.8.

Range in Characteristics

Nepalto family differs from the series because it has slopes greater than 35 percent, on talus slopes, and rock fragments range up to 85 percent

Rock fragments of the control section: 60 to 85 percent gravels, cobbles, stones, and boulders

Particle-size control section clay content: 0 to 8 percent

C horizon

Hue: 5YR

Value: 5 dry, 4 moist

Chroma: 6, dry or moist

Texture: loamy fine sand, loamy sand

Clay: 0 to 8 percent

Calcium carbonate equivalent: 5 to 15 percent

Rock fragments: 60 to 85 percent gravels, cobbles, stones, and boulders

Reaction: strongly alkaline

Tsaya soils

Taxonomic classification: Sandy-skeletal, mixed, mesic Lithic Torriorthents

Geomorphic position: occurs on treads and gaps on cliffs

Parent material: colluvium derived from sandstone

Slope: 35 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: 10 percent

-woody debris: 5 percent

-bare soil: 85 percent

rock fragments

gravel: 30 percent

cobble: 25 percent

stone: 5 percent

boulder: 2 percent

Depth to restrictive feature(s): 4 to 16 inches to bedrock, lithic

Drainage class: excessively 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: 0.4 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very high

Hydrologic group: D

Ecological site name: Sandstone Cliffs 6-10" p.z.

Ecological site number: R035XB254AZ

Present vegetation: Indian ricegrass, black grama, *Ephedra*, beavertail pricklypear, porcupine pricklypear, Bigelow sagebrush, blackbrush, broom snakeweed

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 45' 52.48" north, 111° 35' 52.94" west

A—0 to 2 inches (0 to 5 cm); yellowish red (5YR 5/6) extremely cobbly loamy fine sand, reddish brown (5YR 4/4), moist; 3 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; common very fine irregular and few fine interstitial pores; 35 percent gravel, 25 percent cobble, 5 percent stone, and 2 percent boulder; very slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt wavy boundary.

C—2 to 8 inches (5 to 20 cm); yellowish red (5YR 5/6) extremely cobbly loamy fine sand, reddish brown (5YR 4/4), moist; 5 percent clay; moderate fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; common very fine irregular and few fine interstitial pores; 35 percent gravel, 25 percent cobble, 5 percent stone, and 2 percent boulder; slightly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt smooth boundary.

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

Range in Characteristics

Tsaya, as used in this survey, is a taxadjunct to the series because it has a Sandy-skeletal particle size classification. Tsaya series is a Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Torriorthents.

Rock fragments of the control section: 53 to 80 percent gravels, cobbles, stones, and boulders

Particle-size control section clay content: 2 to 10 percent

A horizon

Hue: 5YR

Value: 5 dry, 4 moist

Chroma: 6 dry, 4 moist

Texture: loamy fine sand

Clay: 0 to 8 percent

Calcium carbonate equivalent: 0 to 5 percent

Rock fragments: 60 to 80 percent gravels, cobbles, stones, and boulders

Reaction: moderately alkaline to strongly alkaline

C horizon

Hue: 5YR

Value: 5 dry, 4 moist

Chroma: 6 dry, 4 moist

Texture: loamy fine sand, loamy sand

Clay: 2 to 10 percent

Calcium carbonate equivalent: 0 to 5 percent

Rock fragments: 50 to 80 percent gravels, cobbles, stones, and boulders

Reaction: moderately alkaline to strongly alkaline

Rock outcrop

Slope: 50 to 90 percent

Exposures of steep bedrock and cliffs, which are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

38—Persayo-Hanksville complex, 4 to 60 percent slopes

Map Unit Setting

Landform(s): hillslopes

Elevation: 4,900 to 6,000 feet (1,493 to 1,829 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Persayo and similar soils: 60 percent

Hanksville and similar soils: 30 percent

Minor Components: 10 percent

-Rock outcrop

-Lithic Torriorthents and similar soils

Soil Properties and Qualities

Persayo soils

Taxonomic classification: Loamy, mixed, active, calcareous, mesic, shallow Typic Torriorthents

Geomorphic position: occurs on backslopes of hillslopes

Parent material: slope alluvium derived from mudstone over residuum weathered from mudstone

Slope: 15 to 60 percent

Surface cover:

Biological crust

-cyanobacteria: 0 percent

-lichen: 0 percent

-moss: 0 percent

Chemical crust

-salt: 0 percent

-gypsum: 5 percent

Physical cover

-canopy plant cover: 0 percent

-woody debris: 0 percent

-bare soil: 95 percent

rock fragments: 0 percent

Depth to restrictive feature(s): 8 to 16 inches to bedrock, paralithic

Drainage class: 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 1.41 micrometers per second)

Available water capacity total inches: 1.9 (very low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: high

Hydrologic group: D

Ecological site name: Mudstone Slopes 6-10" p.z.

Ecological site number: R035XB283AZ

Present vegetation: alkali sacaton, prickly Russian thistle, shadscale

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 10' 14.85" north, 110° 27' 36.50" west

C1—0 to 3 inches (0 to 8 cm); weak red (10R 5/4) silty clay loam, weak red (10R 4/3), moist; 32 percent clay; weak fine prismatic structure; hard, firm, moderately sticky, moderately plastic; few very fine roots; common very fine and fine irregular pores; 10 percent channer; violently effervescent, 15 percent calcium carbonate equivalent and 2 percent gypsum; strongly alkaline, pH 9.0; abrupt smooth boundary.

C2—3 to 11 inches (8 to 28 cm); weak red (10R 4/2) silt loam, dusky red (10R 3/2), moist; 18 percent clay; weak fine prismatic structure; moderately hard, firm, slightly sticky, moderately plastic; few very fine roots; common fine interstitial pores; 10 percent channer; violently effervescent, 15 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.4; abrupt smooth boundary.

CR—11 inches (28 cm); fractured, weathered mudstone bedrock.

Range in Characteristics

Rock fragments of the control section: 5 to 15 percent channers

Particle-size control section clay content: 21 to 35 percent

A, C horizons

Hue: 10R

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 to 4 dry, 2 or 3 moist

Texture: silty clay loam, silt loam, clay, clay loam

Clay: 18 to 40 percent

Calcium carbonate equivalent: 10 to 25 percent

Gypsum: 0 to 4 percent

SAR: 0 to 4

Rock fragments: 5 to 15 percent channers

Reaction: moderately alkaline to strongly alkaline

Hanksville soils

Taxonomic classification: Fine, mixed, active, calcareous, mesic Typic Torriorthents

Geomorphic position: occurs on toeslopes of hillslopes

Parent material: slope alluvium derived from mudstone over residuum weathered from mudstone

Slope: 4 to 15 percent

Surface cover:

Biological crust

-cyanobacteria: 10 percent

-lichen: 0 percent

-moss: 0 percent

Chemical crust

-salt: 0 percent

-gypsum: 5 percent

Physical cover

-canopy plant cover: 10 percent

-woody debris: 0 percent

-bare soil: 85 percent

rock fragments

gravel: 20 percent

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Depth to restrictive feature(s): 20 to 31 inches to bedrock, paralithic
Drainage class: 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 1.41 micrometers per second)
Available water capacity total inches: 4.3 (low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: high
Hydrologic group: C
Ecological site name: Loamy Swale 6-10" p.z. Sodic
Ecological site number: R035XB213AZ
Present vegetation: alkali sacaton, prickly Russian thistle, shadscale
Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 10' 14.60" north, 110° 27' 40.60" west

AC—0 to 4 inches (0 to 10 cm); weak red (10R 5/4) gravelly sandy clay loam, weak red (10R 4/4), moist; 24 percent clay; moderate medium prismatic structure; hard, firm, slightly sticky, slightly plastic; few very fine roots; common very fine and fine irregular pores; 10 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent and 2 percent gypsum; strongly alkaline, pH 9.0; abrupt smooth boundary.

C—4 to 29 inches (10 to 74 cm); weak red (10R 5/4) channery silty clay loam, weak red (10R 4/4), moist; 36 percent clay; moderate fine angular blocky structure; moderately hard, firm, slightly sticky, moderately plastic; few very fine roots; common very fine and fine irregular pores; 10 percent gravel and 10 percent channer; violently effervescent, 15 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.4; abrupt wavy boundary.

CR—29 inches (74 cm); fractured, weathered mudstone bedrock.

Range in Characteristics

Rock fragments of the control section: 10 to 30 percent gravels and channers
Particle-size control section clay content: 35 to 40 percent

AC, C horizons

Hue: 10R

Value: 5 dry, 4 moist

Chroma: 4, dry or moist

Texture: sandy clay loam, silty clay loam, clay, silt loam

Clay: 20 to 40 percent

Calcium carbonate equivalent: 10 to 25 percent

Gypsum: 0 to 4 percent

SAR: 0 to 4

Rock fragments: 10 to 30 percent gravels, and channers

Reaction: moderately alkaline to strongly alkaline

39—Progresso-Skos complex, 2 to 15 percent slopes

Map Unit Setting

Landform(s): plateaus

Elevation: 5,900 to 6,600 feet (1,799 to 2,013 meters)

Soil Survey of Little Colorado River Area, Arizona

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Progresso family and similar soils: 45 percent
Skos and similar soils: 25 percent
Minor Components: 10 percent
-Petrocalcids and similar soils
-Haplocambids and similar soils
-Rock outcrop

Soil Properties and Qualities

Progresso family soils

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Calcic Argids
Geomorphic position: occurs on alluvial fan
Parent material: slope 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: 20 percent
-woody debris: 10 percent
-bare soil: 70 percent
rock fragments
gravel: 5 percent
Depth to restrictive feature(s): 20 to 40 inches to bedrock, paralithic; 36 to 43 inches to bedrock, lithic
Drainage class: well drained
Ksat solum: 0.20 to 19.98 inches per hour (1.40 to 141.00 micrometers per second)
Ksat restrictive layer: 0.00 to 1.98 inches per hour (0.00 to 14.00 micrometers per second)
Available water capacity total inches: 4.8 (low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Runoff class: medium
Hydrologic group: C
Ecological site name: Loamy Upland 10-14" p.z.
Ecological site number: R035XC313AZ
Present vegetation: blue grama, Indian ricegrass, galleta, fourwing saltbush, Douglas rabbitbrush, needle and thread, bottlebrush squirreltail
Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 20' 7.36" north, 111° 36' 59.47" west

A—0 to 2 inches (0 to 5 cm); strong brown (7.5YR 4/6) loamy fine sand, dark brown (7.5YR 3/4), moist; 3 percent clay; moderate medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; few very fine and fine tubular pores; 5 percent gravel; noneffervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bw—2 to 5 inches (5 to 13 cm); strong brown (7.5YR 4/6) fine sandy loam, dark brown (7.5YR 3/4), moist; 5 percent clay; moderate coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few medium, many very fine and fine roots; common very fine and few fine tubular pores; 2 percent gravel; strongly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

Btk1—5 to 14 inches (13 to 36 cm); reddish brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4), moist; 14 percent clay; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few coarse and very fine and common fine and medium roots; common fine and medium tubular pores; few clay films on all faces of peds; many carbonate masses in matrix; 2 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Btk2—14 to 25 inches (36 to 64 cm); yellowish red (5YR 4/6) gravelly clay loam, dark reddish brown (5YR 3/4), moist; 28 percent clay; moderate medium and coarse subangular blocky structure; hard, friable, moderately sticky, moderately plastic; few coarse and common fine and medium roots; common fine tubular pores; common clay films on all faces of peds; many carbonate masses in matrix; 30 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Btk3—25 to 29 inches (64 to 74 cm); reddish brown (5YR 5/4) silt loam, reddish brown (5YR 4/4), moist; 24 percent clay; hard, friable, moderately sticky, moderately plastic; few coarse and common fine and medium roots; common fine tubular pores; common clay films on all faces of peds; many carbonate nodules in matrix; 2 percent channer; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear wavy boundary.

Btk4—29 to 36 inches (74 to 91 cm); reddish brown (5YR 5/4) very channery silt loam, reddish brown (5YR 4/4), moist; 24 percent clay; hard, friable, moderately sticky, moderately plastic; few medium, coarse and common fine and medium roots; few fine tubular pores; few clay films on all faces of peds; common carbonate masses in matrix; 40 percent channer; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

CR—36 to 39 inches (91 to 99 cm); fractured, weathered sandstone bedrock.

R—39 inches (99 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Progresso family differs from the series because it has loamy sand surface textures, silt loam subsurface textures, and more than 15 percent rock fragments.

Rock fragments of the control section: 11 to 29 percent gravels

Particle-size control section clay content: 25 to 33 percent

Soil Survey of Little Colorado River Area, Arizona

A horizon

Hue: 5YR, 7.5YR
Value: 3 or 4, dry or moist
Chroma: 4 or 6, dry or moist
Texture: loamy fine sand
Clay: 1 to 5 percent
Rock fragments: 0 to 12 percent gravels
Reaction: moderately alkaline

Bw horizon

Hue: 5YR, 7.5YR
Value: 3 or 4, dry or moist
Chroma: 4 or 6, dry or moist
Texture: fine sandy loam, sandy loam
Clay: 4 to 10 percent
Calcium carbonate equivalent: 0 to 2 percent
Rock fragments: 0 to 12 percent gravels
Reaction: moderately alkaline

Btk horizon

Hue: 5YR, 7.5YR
Value: 4 or 5 dry, 3 or 4 moist
Chroma: 4 or 6, dry or moist
Texture: fine sandy loam, clay loam, silt loam
Clay: 10 to 35 percent
Calcium carbonate equivalent: 5 to 25 percent
Rock fragments: 0 to 35 percent gravels, channers
Reaction: moderately alkaline

Argillic horizon: the zone from 14 to 36 inches (36 to 91 cm), (Btk horizon)

Calcic horizon: the zone from 14 to 36 inches (36 to 91 cm), (Btk horizon)

Some pedons do not have the Cr horizon above the R horizon.

Skos soils

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

Geomorphic position: occurs on upper pediment summits and side slopes

Parent material:

Slope: 4 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: 20 percent

-woody debris: 10 percent

-bare soil: 70 percent

rock fragments

channer: 60 percent

flagstone: 5 percent

Depth to restrictive feature(s): 4 to 20 inches to bedrock, lithic

Soil Survey of Little Colorado River Area, Arizona

Drainage class: well drained

Ksat solum: 0.57 to 1.98 inches per hour (4.00 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: 0.9 (very low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: very high

Hydrologic group: D

Ecological site name: Sandstone Upland 10-14" p.z.

Ecological site number: R035XC314AZ

Present vegetation: Colorado pinyon, Utah juniper, purple birdsbeak, threadleaf snakeweed, Utah serviceberry

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 20' 37.00" north, 111° 36' 12.00" west

A—0 to 2 inches (0 to 5 cm); reddish brown (5YR 4/4) extremely channery loam, dark reddish brown (5YR 3/4), moist; 18 percent clay; moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; few very fine vesicular pores; 70 percent channer; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C1—2 to 8 inches (5 to 20 cm); yellowish red (5YR 5/6) very channery loam, yellowish red (5YR 4/6), moist; 18 percent clay; moderately hard, very friable, moderately sticky, moderately plastic; common very fine roots; few very fine vesicular pores; 45 percent channer; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—8 to 11 inches (20 to 28 cm); yellowish red (5YR 5/6) extremely channery loam, yellowish red (5YR 4/6), moist; 20 percent clay; massive; moderately hard, very friable, moderately sticky, moderately plastic; common fine roots; few fine vesicular pores; 75 percent channer; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

R—11 inches (28 cm); unweathered, unfractured sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 49 to 70 percent channers

Particle-size control section clay content: 18 to 27 percent

A horizon

Hue: 5YR

Value: 3 or 4, dry or moist

Chroma: 4, dry or moist

Texture: loam

Clay: 12 to 27 percent

Calcium carbonate equivalent: 0 to 10 percent

Rock fragments: 65 to 88 percent channers

Reaction: moderately alkaline

C horizon

Hue: 5YR

Value: 4 or 5, dry or moist

Chroma: 6, dry or moist
Texture: loam
Clay: 12 to 27 percent
Calcium carbonate equivalent: 0 to 10 percent
Rock fragments: 35 to 88 percent channers
Reaction: moderately alkaline

40—Puertecito very cobbly loam, 15 to 35 percent slopes

Map Unit Setting

Landform(s): plateaus
Elevation: 6,400 to 7,000 feet (1,950 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 12.0 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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Puertecito and similar soils: 80 percent
Minor Components: 20 percent
-Soils that have petrocalcic horizons
-Soils in drainageways that are occasionally flooded
-Soils that are deep than 20 inches to bedrock
-Soils that have calcium carbonate in the profile no accumulation of
-Soils that have larger amounts of clay in the profile

Soil Properties and Qualities

Puertecito soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Lithic Ustic Haplargids

Geomorphic position: occurs on side slopes of hills and ridges

Parent material: residuum weathered from cherty limestone

Slope: 15 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: 60 percent

-woody debris: 10 percent

-bare soil: 30 percent

rock fragments: 0 percent

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)

Soil Survey of Little Colorado River Area, Arizona

Ksat restrictive layer: 0.00 to 0.06 inches per hour (0.00 to 0.42 micrometers per second)

Available water capacity total inches: 1.2 (very low)

Shrink-swell potential: about 1.0 LEP (low)

Flooding hazard: none

Runoff class: very high

Hydrologic group: D

Ecological site name: Limestone/Sandstone Hills 10-14" p.z.

Ecological site number: R035XC308AZ

Present vegetation: muttongrass, Wyoming big sagebrush, other perennial grasses, blue grama, Utah juniper, *Ephedra*, Stansbury cliffrose

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Grand Canyon Area, Arizona, Parts of Coconino and Mohave Counties.

Location

Geographic Coordinate System: 36° 3' 34.00" north, 111° 47' 57.00" west

A—0 to 4 inches (0 to 10 cm); light brown (7.5YR 6/3) very cobbly loam, brown (7.5YR 4/3), moist; 18 percent clay; weak medium platy parts to moderate very fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common very fine roots; few very fine, fine vesicular and common very fine tubular pores; 20 percent gravel, 25 percent cobble, and 5 percent stone; noneffervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Btk1—4 to 11 inches (10 to 28 cm); light brown (7.5YR 6/3) very cobbly loam, brown (7.5YR 4/3), moist; 23 percent clay; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few medium and common very fine and fine roots; common very fine and few fine tubular pores; many clay films on surfaces along pores and many clay bridges between sand grains; common carbonate masses in matrix; 25 percent gravel and 30 percent cobble; slightly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; clear wavy boundary.

Btk2—11 to 15 inches (28 to 38 cm); light brown (7.5YR 6/3) extremely cobbly loam, brown (7.5YR 4/3), moist; 23 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few medium and very fine and few fine roots; few very fine and fine pores; common clay bridges between sand grains; common carbonate masses in matrix; 25 percent gravel and 45 percent cobble; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt wavy boundary.

R—15 inches (38 cm); unfractured, slightly weathered limestone bedrock.

Range in Characteristics

Rock fragments of the control section: 47 to 84 percent gravels, cobbles, and stones
Particle-size control section clay content: 20 to 25 percent

A horizon

Hue: 7.5YR

Value: 4 or 6, dry or moist

Chroma: 3, dry or moist

Texture: loam

Clay: 15 to 20 percent

Rock fragments: 40 to 80 percent gravels, cobbles, and stones

Reaction: slightly alkaline to moderately alkaline

Btk horizon

Hue: 7.5YR
Value: 4 or 6, dry or moist
Chroma: 3, dry or moist
Texture: loam
Clay: 20 to 25 percent
Calcium carbonate equivalent: 0 to 15 percent
Rock fragments: 45 to 90 percent gravels, cobbles, and stones
Reaction: slightly alkaline to moderately alkaline

Argillic horizon: the zone from 4 to 15 inches (10 to 38 cm), (Btk horizon)

Some pedons developed in chert, cherty limestone, or cherty sandstone residuum and do not have a Btk horizon.

Some Btk horizons are weakly cemented with calcium carbonate but do not meet the thickness requirement for a Calcic horizon.

41—Radnik-Escavada-Riverwash complex, 0 to 3 percent slopes

Map Unit Setting

Landform(s): flood-plain steps, flood plains
Elevation: 5,250 to 5,850 feet (1,600 to 1,783 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Radnik and similar soils: 50 percent
Escavada and similar soils: 25 percent
Riverwash: 15 percent
Minor Components: 10 percent
-Riverwash
-soils that have a stony, very stony, or bouldery surface phase

Soil Properties and Qualities

Radnik soils

Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Ustic
Torrifluvents

Geomorphic position: occurs on flood-plain steps

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

Soil Survey of Little Colorado River Area, Arizona

Physical cover

- canopy plant cover: 20 percent
 - woody debris: 10 percent
 - bare soil: 70 percent
- rock fragments
gravel: 12 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: 4.5 (low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: rare

Runoff class: very low

Hydrologic group: A

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

Ecological site number: R035XC315AZ

Present vegetation: *Ephedra*, blue grama, sand sagebrush, needle and thread, Indian ricegrass, galleta, *Sporobolus*, sandhill muhly

Land capability (irrigated): 3e

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 24' 53.60" north, 111° 32' 20.80" west

Ap—0 to 6 inches (0 to 15 cm); reddish brown (5YR 5/4) loamy sand, reddish brown (5YR 4/4), moist; 8 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; few medium, very fine and fine roots; common fine tubular pores; 11 percent gravel; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

C1—6 to 30 inches (15 to 76 cm); yellowish red (5YR 5/6) gravelly loamy sand, yellowish red (5YR 4/6), moist; 6 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine roots; common fine tubular pores; 18 percent gravel; very slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

C2—30 to 42 inches (76 to 107 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 13 percent clay; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; common very fine and fine tubular pores; common carbonate, finely disseminated; strongly effervescent, 5 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

C3—42 to 60 inches (107 to 152 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 16 percent clay; massive; slightly hard, very firm, slightly sticky, slightly plastic; few very fine roots; common very fine tubular pores; common carbonate masses in matrix and common carbonate, finely disseminated; strongly effervescent, 5 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

Range in Characteristics

Rock fragments of the control section: 0 to 20 percent gravels

Particle-size control section clay content: 6 to 14 percent

A, Ap horizons

Hue: 2.5YR, 5YR

Soil Survey of Little Colorado River Area, Arizona

Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: loamy sand, loamy fine sand
Clay: 5 to 8 percent
Calcium carbonate equivalent: 0 to 2 percent
Rock fragments: 0 to 12 percent gravels
Reaction: moderately alkaline to strongly alkaline

C horizon

Hue: 2.5YR, 5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: sand, loamy sand, loamy fine sand, fine sandy loam
Clay: 3 to 16 percent
Calcium carbonate equivalent: 0 to 5 percent
Rock fragments: 0 to 20 percent gravels
Reaction: moderately alkaline to strongly alkaline

Escavada soils

Taxonomic classification: Sandy, mixed, mesic Ustic Torrfluvents

Geomorphic position: occurs on floodplains

Parent material: alluvium derived from sandstone and siltstone

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: 10 percent

-bare soil: 70 percent

rock fragments: 0 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: 3.3 (low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: occasional

Runoff class: negligible

Hydrologic group: A

Ecological site name: Sandy Wash 10-14" p.z.

Ecological site number: R035XC357AZ

Present vegetation: rubber rabbitbrush, fourwing saltbush, threadleaf groundsel, sand dropseed

Land capability (irrigated): 4e

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 33' 47.70" north, 111° 38' 5.70" west

Soil Survey of Little Colorado River Area, Arizona

A—0 to 4 inches (0 to 10 cm); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 5/6), moist; 4 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; common very fine and fine irregular pores; noneffervescent; slightly alkaline, pH 7.6; abrupt wavy boundary.

C1—4 to 8 inches (10 to 20 cm); yellowish red (5YR 5/6) loamy sand, yellowish red (5YR 4/6), moist; 6 percent clay; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; few very fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; gradual smooth boundary.

C2—8 to 22 inches (20 to 56 cm); yellowish red (5YR 5/6) sand, yellowish red (5YR 4/6), moist; 5 percent clay; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual smooth boundary.

C3—22 to 30 inches (56 to 76 cm); yellowish red (5YR 5/6) loamy sand, yellowish red (5YR 4/6), moist; 6 percent clay; massive; soft, loose, nonsticky, nonplastic; few very fine roots; few very fine interstitial pores; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual smooth boundary.

C4—30 to 37 inches (76 to 94 cm); reddish yellow (5YR 6/6) very gravelly sand, yellowish red (5YR 5/6), moist; 3 percent clay; massive; soft, loose, nonsticky, nonplastic; few coarse roots; few very fine interstitial pores; 35 percent gravel; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

C5—37 to 48 inches (94 to 122 cm); reddish yellow (5YR 6/6) sand, yellowish red (5YR 5/6), moist; 4 percent clay; massive; soft, loose, nonsticky, nonplastic; few very fine roots; few very fine interstitial pores; very slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; gradual wavy boundary.

C6—48 to 57 inches (122 to 145 cm); reddish yellow (5YR 6/6) gravelly sand, yellowish red (5YR 5/6), moist; 3 percent clay; massive; soft, loose, nonsticky, nonplastic; few very fine roots; few very fine interstitial pores; 33 percent gravel; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

C7—57 to 60 inches (145 to 152 cm); reddish yellow (5YR 6/6) sand, yellowish red (5YR 5/6), moist; 4 percent clay; massive; soft, loose, nonsticky, nonplastic; few very fine interstitial pores; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

Range in Characteristics

Rock fragments of the control section: 5 to 10 percent gravels

Particle-size control section clay content: 3 to 5 percent

A, C horizon

Hue: 2.5YR, 5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 or 6, dry or moist

Texture: fine sand, sand, loamy sand, loamy fine sand, coarse sand

Clay: 1 to 7 percent

Calcium carbonate equivalent: 0 to 2 percent

Rock fragments: 0 to 40 percent gravels

Reaction: slightly alkaline to strongly alkaline

Riverwash

Slope: 0 to 2 percent

Unstabilized sandy, silty, clayey, or gravelly sediment that is flooded, washed, and reworked frequently by rivers, and usually devoid of vegetation.

42—Reef-Progresso family complex, 8 to 35 percent slopes

Map Unit Setting

Landform(s): structural benches

Elevation: 5,580 to 6,500 feet (1,700 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 12.0 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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Reef and similar soils: 50 percent

Progresso family and similar soils: 25 percent

Minor Components: 25 percent

-Skos and similar soils

-Tassi and similar soils

-Rock outcrop

Soil Properties and Qualities

Reef soils

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

Geomorphic position: occurs on summits and structural benches of mesas

Parent material: residuum weathered from sandstone and shale

Slope: 8 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: 20 percent

-woody debris: 10 percent

-bare soil: 70 percent

rock fragments

gravel: 20 percent

channer: 30 percent

flagstone: 15 percent

Depth to restrictive feature(s): 4 to 13 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)

Soil Survey of Little Colorado River Area, Arizona

Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 1.0 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very high

Hydrologic group: D

Ecological site name: Sandy Slopes 10-14" p.z. Bouldery

Ecological site number: R035XC371AZ

Present vegetation: Colorado pinyon, Utah juniper, purple birdsbeak, threadleaf snakeweed, Utah serviceberry

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 19' 59.00" north, 111° 37' 5.00" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) extremely channery fine sandy loam, brown (7.5YR 4/4), moist; 14 percent clay; moderate fine subangular blocky; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; few coarse irregular and common fine and medium irregular pores; 10 percent gravel, 50 percent channer, and 15 percent flagstone; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C1—2 to 9 inches (5 to 23 cm); light brown (7.5YR 6/4) very channery loam, brown (7.5YR 4/4), moist; 16 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few coarse and many fine roots; few very fine and fine vesicular pores; 50 percent channer and 2 percent flagstone; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear wavy boundary.

C2—9 to 13 inches (23 to 33 cm); brown (7.5YR 5/4) extremely channery loam, brown (7.5YR 4/4), moist; 16 percent clay; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; common medium, coarse, very fine, and fine roots; few very fine and fine vesicular pores; 70 percent channer; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

R—13 inches (33 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 46 to 69 gravels, channers, and flagstones

Particle-size control section clay content: 12 to 18 percent

A horizon

Hue: 7.5YR

Value: 5 dry, 4 moist

Chroma: 4, dry or moist

Texture: fine sandy loam

Clay: 12 to 18 percent

Calcium carbonate equivalent: 1 to 4 percent

Rock fragments: 60 to 85 percent gravels, channers, and flagstones

Reaction: moderately alkaline

C horizon

Hue: 7.5YR

Value: 5 or 6 dry, 4 moist

Chroma: 4, dry or moist

Soil Survey of Little Colorado River Area, Arizona

Texture: loam, fine sandy loam
Clay: 12 to 20 percent
Calcium carbonate equivalent: 1 to 4 percent
Rock fragments: 35 to 85 percent channers and flagstones
Reaction: moderately alkaline to strongly alkaline

Progresso family soils

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Calcic Argids

Geomorphic position: occurs on colluvial side slopes of mesas

Parent material: colluvium derived from sandstone and shale

Slope: 8 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: 30 percent

-woody debris: 10 percent

-bare soil: 60 percent

rock fragments

gravel: 40 percent

cobble: 5 percent

stone: 5 percent

boulder: 10 percent

Depth to restrictive feature(s): 28 to 35 inches to bedrock, paralithic; 38 to 55 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: 4.2 (low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: high

Hydrologic group: C

Ecological site name: Sandy Slopes 10-14" p.z. Bouldery

Ecological site number: R035XC371AZ

Present vegetation: galleta, black grama, Mormon needlegrass, *Ephedra*, tuberous pricklypear, Utah juniper, Douglas rabbitbrush, Bigelow sagebrush

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 20' 49.00" north, 111° 35' 47.00" west

A—0 to 4 inches (0 to 10 cm); reddish brown (5YR 4/4) gravelly loam, dark reddish brown (5YR 3/4), moist; 7 percent clay; weak fine and medium subangular blocky parts to weak very fine granular structure; soft, very friable; common very fine roots; many very fine vesicular pores; 25 percent gravel; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Soil Survey of Little Colorado River Area, Arizona

Bw—4 to 8 inches (10 to 20 cm); reddish brown (5YR 4/4) gravelly loam, dark reddish brown (5YR 3/4), moist; 20 percent clay; moderate medium and coarse subangular blocky structure; slightly hard, friable; common very fine roots; many very fine tubular pores; 20 percent gravel; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Btk—8 to 13 inches (20 to 33 cm); reddish brown (5YR 4/4) gravelly silty clay loam, dark reddish brown (5YR 3/4), moist; 30 percent clay; moderate coarse subangular blocky structure; moderately hard, firm; common very fine and fine roots; common very fine and few fine tubular pores; few clay films on surfaces along pores; many carbonate masses in matrix; 20 percent gravel and 5 percent cobble; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk1—13 to 22 inches (33 to 56 cm); yellowish red (5YR 4/6) silt loam, yellowish red (5YR 5/6), moist; 13 percent clay; moderate coarse subangular blocky structure; moderately hard, firm; few very fine roots; few very fine and fine tubular pores; many carbonate masses in matrix; 5 percent gravel and 5 percent channer; violently effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

Bk2—22 to 28 inches (56 to 71 cm); yellowish red (5YR 5/6) silt loam, yellowish red (5YR 4/6), moist; 8 percent clay; weak coarse subangular blocky structure; moderately hard, firm; few very fine roots; few very fine and fine tubular pores; common carbonate masses in matrix; 5 percent gravel and 5 percent cobble; violently effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

CR—28 to 52 inches (71 to 132 cm); fractured, weathered shale bedrock.

R—52 inches (132 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Progresso family differs from the series because it has silt loam to silty clay loam textures, paralithic contact above 40 inches, and 15 to 30 percent coarse fragments.

Rock fragments of the control section: 15 to 30 percent gravels

Particle-size control section clay content: 27 to 35 percent

A horizon

Hue: 5YR

Value: 3 or 4, dry or moist

Chroma: 4, dry or moist

Texture: loam

Clay: 7 to 15 percent

Calcium carbonate equivalent: 0 to 4 percent

Rock fragments: 15 to 30 percent gravels

Reaction: moderately alkaline

Bw horizon

Hue: 5YR

Value: 3 or 4, dry or moist

Chroma: 4, dry or moist

Texture: loam

Clay: 12 to 27 percent

Calcium carbonate equivalent: 0 to 10 percent

Rock fragments: 15 to 30 percent gravels and cobbles

Reaction: moderately alkaline

Btk horizon

Hue: 5YR
Value: 3 or 4, dry or moist
Chroma: 4, dry or moist
Texture: silty clay loam, clay loam
Clay: 27 to 35 percent
Calcium carbonate equivalent: 15 to 25 percent
SAR: 0 to 4
Rock fragments: 15 to 30 percent gravels
Reaction: moderately alkaline

Bk horizon

Hue: 5YR
Value: 4 or 5, dry or moist
Chroma: 6, dry or moist
Texture: silt loam, loam
Clay: 5 to 20 percent
Calcium carbonate equivalent: 5 to 15 percent
SAR: 0 to 4
Rock fragments: 0 to 12 percent channers
Reaction: strongly alkaline

Argillic horizon: the zone from 8 to 13 inches (20 to 33 cm), (Btk horizon)

Calcic horizon: the zone from 8 to 13 inches (20 to 33 cm), (Btk horizon)

43—Reef-Rock outcrop complex, 4 to 35 percent slopes

Map Unit Setting

Landform(s): plateaus

Elevation: 5,700 to 6,180 feet (1,737 to 1,884 meters)

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)

Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Reef and similar soils: 65 percent

Rock outcrop: 25 percent

Minor Components: 10 percent

-Loamy-skeletal Lithic Ustic Haplocalcids

-Loamy-skeletal Lithic Ustic Haplargids

Soil Properties and Qualities

Reef soils

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

Geomorphic position: occurs on side slopes of canyons

Parent material: colluvium derived from sandstone

Slope: 4 to 35 percent

Surface cover:

Soil Survey of Little Colorado River Area, Arizona

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
- rock fragments
- gravel: 75 percent

Depth to restrictive feature(s): 4 to 13 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: 0.00 to 0.20 inches per hour (0.00 to 1.40 micrometers per second)

Available water capacity total inches: 0.9 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very high

Hydrologic group: D

Ecological site name: Limestone/Sandstone Hills 10-14" p.z.

Ecological site number: R035XC308AZ

Present vegetation: Wyoming big sagebrush, fourwing saltbush, blue grama, bottlebrush squirreltail

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 30' 9.21" north, 111° 36' 17.23" west

A—0 to 2 inches (0 to 5 cm); yellowish brown (10YR 5/4) very gravelly loam, dark yellowish brown (10YR 4/4), moist; 8 percent clay; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine roots; common very fine irregular pores; 55 percent gravel; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C1—2 to 6 inches (5 to 15 cm); light yellowish brown (10YR 6/4) very gravelly very fine sandy loam, yellowish brown (10YR 5/4), moist; 6 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine irregular pores; common carbonate, finely disseminated; 50 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—6 to 11 inches (15 to 28 cm); light yellowish brown (10YR 6/4) extremely gravelly very fine sandy loam, yellowish brown (10YR 5/4), moist; 6 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and few fine roots; common very fine irregular pores; common carbonate, finely disseminated; 50 percent gravel and 30 percent cobble; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

R—11 inches (28 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 35 to 57 percent gravels and cobbles
Particle-size control section clay content: 5 to 10 percent

A horizon

Hue: 7.5YR, 10YR
Value: 4 or 5 dry, 3 or 4 moist
Chroma: 3 or 4, dry or moist
Texture: loam
Clay: 7 to 10 percent
Calcium carbonate equivalent: 1 to 4 percent
Rock fragments: 40 to 55 percent gravels
Reaction: moderately alkaline

C horizon

Hue: 7.5YR, 10YR
Value: 4 to 6 dry, 3, to 5 moist
Chroma: 4 or 6, dry or moist
Texture: loam, fine sandy loam, very fine sandy loam
Clay: 5 to 10 percent
Calcium carbonate equivalent: 1 to 4 percent
Rock fragments: 40 to 85 percent gravels and cobbles
Reaction: moderately alkaline

Rock outcrop

Slope: 35 to 60 percent

Exposures of steep bedrock and cliffs, which are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material

44—Rock outcrop-Lithic Torriorthents complex, Kaibab, Toroweap, and Coconino Formations, 15 to 60 percent slopes

Map Unit Setting

Landform(s): plateaus

Elevation: 3,200 to 5,800 feet (976 to 1,768 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Rock outcrop: 60 percent

Lithic Torriorthents and similar soils: 40 percent

Because of extreme inaccessibility resulting in minimum documentation, minor components could not be statistically validated. Major components were determined by documented site visits or were extrapolated from remote sensing.

Soil Properties and Qualities

Rock outcrop

Slope: 15 to 90 percent

Exposures of steep bedrock and cliffs, which are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

Lithic Torriorthents soils

Taxonomic classification: Lithic Torriorthents

Geomorphic position: occur on colluvial slopes and pockets on ledges of plateau escarpments and canyon sidewalls

Parent material: colluvium derived from limestone, sandstone, and shale

Slope: 15 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: 20 percent

-woody debris: 5 percent

-bare soil: 80 percent

rock fragments: 0 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic

Drainage class: well drained

Ksat solum: 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)

Ksat restrictive layer: 0.00 to 0.06 inches per hour (0.00 to 0.42 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

Ecological site name: Limestone/Sandstone Cliffs 6-10" p.z.

Ecological site number: R035XB240AZ

Present vegetation: shadscale saltbush, Bigelow sagebrush, fourwing saltbush, *Ephedra*, black grama, pricklypear

Land capability (non irrigated): 7c

Typical Profile

Typical pedon is from the Soil Survey of Grand Canyon Area, Arizona, Parts of Coconino and Mohave Counties.

Location

Geographic Coordinate System: 36° 50' 50.00" , 111° 36' 53.00"

A—0 to 2 inches (0 to 5 cm); yellowish brown (10YR 5/4) extremely gravelly sandy loam, dark yellowish brown (10YR 4/4), moist; 10 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common coarse and fine roots; common fine irregular pores; 40 percent gravel, 20 percent cobble, and 5

percent stone; violently effervescent, 15 percent calcium carbonate equivalent and 0 percent gypsum; moderately alkaline, pH 8.4; abrupt smooth boundary.

C—2 to 9 inches (5 to 23 cm); yellowish brown (10YR 5/4) extremely gravelly sandy loam, dark yellowish brown (10YR 4/4), moist; 10 percent clay; massive; soft, very friable, nonsticky, nonplastic; common coarse and fine roots; common fine tubular pores; 40 percent gravel, 20 percent cobble, and 5 percent stone; violently effervescent, 15 percent calcium carbonate equivalent and 0 percent gypsum; moderately alkaline, pH 8.4; abrupt irregular boundary.

R—9 inches (23 cm); unfractured, unweathered limestone bedrock.

Range in Characteristics

Lithic Torriorthents have soil properties that vary outside of family class limits.

Soils in this landscape position are highly variable with respect to depth, texture, color, and/or chemical properties. Because of extremely difficult access, statistically valid data could not be determined. Therefore physical and chemical properties of specific horizons are not given, and interpretations such as erodibility are not determined. The taxonomic unit description is only an example of what may be found in this landscape position.

45—Rock outcrop-Lithic Torriorthents complex, Supai Group, 15 to 60 percent slopes

Map Unit Setting

Landform(s): plateaus

Elevation: 3,200 to 6,000 feet (976 to 1,829 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

Land Resource Unit: 35-5 Colorado Plateau - Grand Canyon Corridor

Map Unit Composition

Rock outcrop: 60 percent

Lithic Torriorthents and similar soils: 40 percent

Because of extreme inaccessibility resulting in minimum documentation, minor components could not be statistically validated. Major components were determined by documented site visits or were extrapolated from remote sensing.

Soil Properties and Qualities

Rock outcrop

Slope: 15 to 60 percent

Exposures of steep bedrock and cliffs, which are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

Lithic Torriorthents soils

Taxonomic classification: Lithic Torriorthents

Geomorphic position: occurs on pockets on ledges

Parent material: colluvium derived from calcareous sandstone

Soil Survey of Little Colorado River Area, Arizona

Slope: 15 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: 20 percent

-woody debris: 5 percent

-bare soil: 80 percent

rock fragments: 0 percent

Depth to restrictive feature(s): 3 to 20 inches to bedrock, lithic

Drainage class: excessively drained

Ksat solum: 5.95 to 19.98 inches per hour (42.00 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: 0.2 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: medium

Hydrologic group: D

Ecological site name: Sedimentary Cliffs 6-10" p.z.

Ecological site number: R035XE516AZ

Present vegetation: *Ephedra*, shadscale saltbush, pricklypear

Land capability (non irrigated): 7c

Typical Profile

Typical pedon is from the Soil Survey of Grand Canyon Area, Arizona, Parts of Coconino and Mohave Counties.

Location

Geographic Coordinate System: 36° 37' 56.00" north, 111° 45' 53.00" west

C—0 to 5 inches (0 to 13 cm); reddish brown (5YR 5/4) extremely gravelly loamy coarse sand, reddish brown (5YR 4/4), moist; 5 percent clay; single grain; loose, nonsticky, nonplastic; common very fine roots; common fine irregular pores; 50 percent gravel, 5 percent cobble, and 10 percent stone; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt irregular boundary.

R—5 inches (13 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Lithic Torriorthents have soil properties that vary outside of family class limits.

Soils in this landscape position are highly variable with respect to depth, texture, color, and/or chemical properties. Because of extremely difficult access, statistically valid data could not be determined. Therefore physical and chemical properties of specific horizons are not given, and interpretations such as erodibility are not determined. The taxonomic unit description is representative of what may be found in this landscape position.

46—Rock outcrop-Mathis-Nalcase complex, 10 to 50 percent slopes

Map Unit Setting

Landform(s): escarpments

Elevation: 4,500 to 6,500 feet (1,371 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 12.0 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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Rock outcrop: 65 percent

Mathis and similar soils: 15 percent

Nalcase and similar soils: 15 percent

Minor components: 5 percent

-Active dunes and sand sheets

-Riverwash

-Gullied land

Soil Properties and Qualities

Rock outcrop

Slope: 30 to 80 percent

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.

Mathis soils

Taxonomic classification: Sandy-skeletal, mixed, mesic Ustic Torriorthents

Geomorphic position: occurs on structural benches and ledges on escarpments

Parent material: eolian sands over colluvium derived from sandstone

Slope: 10 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: 10 percent

-woody debris: 3 percent

-bare soil: 15 percent

rock fragments

channer: 40 percent

flagstone: 25 percent

stone: 15 percent

Depth to restrictive feature(s): 20 to 40 inches to bedrock, lithic

Drainage class: excessively drained

Ksat solum: 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)

Soil Survey of Little Colorado River Area, Arizona

Ksat restrictive layer: 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity total inches: 1.1 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: medium

Hydrologic group: A

Ecological site name: Pinus edulis-Juniperus osteosperma/Quercus xpauciloba-Purshia stansburiana/Muhlenbergia pungens

Ecological site number: F035XC374AZ

Present vegetation: broom snakeweed, Colorado pinyon, sandhill muhly, Stansbury cliffrose, Utah juniper

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Navajo Mountain Area, Arizona, Parts of Apache, Coconino, and Navajo Counties.

Location

Geographic Coordinate System: 36° 49' 54.20" north, 110° 57' 34.20" west

C1—0 to 3 inches (0 to 8 cm); yellowish red (5YR 5/6) extremely flaggy sand, yellowish red (5YR 4/6), moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; few very fine and fine tubular pores; 40 percent channer, 25 percent flagstone, and 15 percent stone; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual wavy boundary.

C2—3 to 12 inches (8 to 30 cm); yellowish red (5YR 5/6) channery sand, yellowish red (5YR 4/6), moist; 4 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; few very fine and fine tubular pores; 20 percent channer and 10 percent flagstone; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; gradual irregular boundary.

C3—12 to 26 inches (30 to 66 cm); yellowish red (5YR 5/6) very channery sand, yellowish red (5YR 4/6), moist; 2 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots; few very fine and fine tubular pores; 30 percent channer and 10 percent flagstone; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt irregular boundary.

R—26 inches (66 cm); fractured, unweathered sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 35 to 59 percent channers, flagstones, and stones

Particle-size control section clay content: 1 to 8 percent

C horizon

Hue: 5YR, 7.5YR

Value: 4 or 5, dry or moist

Chroma: 6, dry or moist

Texture: sand, loamy sand

Clay: 1 to 8 percent

Calcium carbonate equivalent: 0 to 2 percent

SAR: 0 to 4

Rock fragments: 15 to 90 percent channers, flagstones, and stones

Reaction: moderately alkaline to strongly alkaline

Soil Survey of Little Colorado River Area, Arizona

Some pedons have a thin Cr horizon.

Nalcase soils

Taxonomic classification: Siliceous, mesic Lithic Torripsamments

Geomorphic position: occurs on structural benches and ledges on escarpments

Parent material: eolian sands over colluvium derived from Navajo sandstone

Slope: 15 to 30 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: 80 percent

rock fragments: 0 percent

Depth to restrictive feature(s): 5 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: 0.8 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: high

Hydrologic group: D

Ecological site name: Pinus edulis-Juniperus osteosperma/Quercus xpauciloba-Purshia stansburiana/Muhlenbergia pungens

Ecological site number: F035XC374AZ

Present vegetation: Colorado pinyon, Utah juniper, wavyleaf oak, Stansbury cliffrose, sandhill muhly, Bigelow sagebrush

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Navajo Mountain Area, Arizona, Parts of Apache, Coconino, and Navajo Counties.

Location

Geographic Coordinate System: 36° 20' 37.80" north, 111° 28' 31.00" west

C1—0 to 3 inches (0 to 8 cm); strong brown (7.5YR 5/6) fine sand, strong brown (7.5YR 4/6), moist; 2 percent clay; single grain; loose, nonsticky, nonplastic; few very fine and fine roots; few very fine and fine tubular pores; noneffervescent; moderately alkaline, pH 8.2; very abrupt wavy boundary.

C2—3 to 11 inches (8 to 28 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; few medium roots and few fine roots; few very fine and fine tubular pores; noneffervescent; moderately alkaline, pH 8.0; clear wavy boundary.

R—11 inches (28 cm); fractured, unweathered sandstone bedrock.

Range in Characteristics

Particle-size control section clay content: 1 to 5 percent

C horizon

Hue: 5YR, 7.5YR

Value: 4 or 5, dry or moist

Chroma: 6, dry or moist

Texture: fine sand

Clay: 1 to 6 percent

Calcium carbonate equivalent: 0 to 2 percent

Rock fragments: 0 to 5 percent gravels

Reaction: moderately alkaline

Some pedons have a thin Cr horizon above the lithic contact.

47—Rock outcrop-Typic Torriorthents complex, Hermit Formation, 15 to 60 percent slopes

Map Unit Setting

Landform(s): plateaus

Elevation: 3,200 to 6,000 feet (976 to 1,829 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

Land Resource Unit: 35-5 Colorado Plateau - Grand Canyon Corridor

Map Unit Composition

Rock outcrop: 60 percent

Typic Torriorthents and similar soils: 40 percent

Because of extreme inaccessibility resulting in minimum documentation, minor components could not be statistically validated. Major components were determined by documented site visits or were extrapolated from remote sensing.

Soil Properties and Qualities

Rock outcrop

Slope: 15 to 60 percent

Exposures of steep bedrock and cliffs, which are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

Typic Torriorthents soils

Taxonomic classification: Typic Torriorthents

Geomorphic position: occurs on colluvial slopes on plateau escarpments and canyon sidewalls

Parent material: colluvium derived from limestone and sandstone

Slope: 15 to 60 percent

Soil Survey of Little Colorado River Area, Arizona

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: 80 percent
- rock fragments: 0 percent

Depth to restrictive feature(s): 21 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: 0.00 to 0.57 inches per hour (0.00 to 4.00 micrometers per second)

Available water capacity total inches: 3.2 (low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: medium

Hydrologic group: B

Ecological site name: Sedimentary Cliffs 6-10" p.z.

Ecological site number: R035XE516AZ

Present vegetation: *Ephedra*, shadscale saltbush, pricklypear

Land capability (non irrigated): 7c

Typical Profile

Typical pedon is from the Soil Survey of Grand Canyon Area, Arizona, Parts of Coconino and Mohave Counties.

Location

Geographic Coordinate System: 36° 45' 3.00" north, 111° 40' 25.00" west

C1—0 to 8 inches (0 to 20 cm); light brown (7.5YR 6/4) extremely stony fine sandy loam, brown (7.5YR 4/4), moist; 12 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine roots; many very fine irregular pores; 20 percent gravel, 10 percent cobble, and 55 percent stone; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear irregular boundary.

C2—8 to 20 inches (20 to 51 cm); reddish yellow (5YR 6/6) very stony coarse sandy loam, yellowish red (5YR 5/6), moist; 8 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few fine roots; common fine irregular pores; 5 percent gravel, 20 percent cobble, and 20 percent stone; noneffervescent; moderately alkaline, pH 8.2; clear irregular boundary.

C3—20 to 40 inches (51 to 102 cm); yellowish red (5YR 5/6) very cobbly sandy clay loam, yellowish red (5YR 4/6), moist; 22 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few fine roots; common fine irregular pores; 20 percent gravel, 10 percent cobble, and 5 percent stone; noneffervescent; moderately alkaline, pH 8.2; abrupt irregular boundary.

R—40 inches (102 cm); unfractured, unweathered shale bedrock.

Range in Characteristics

Typic Torriorthents have soil properties that vary outside of the family class limits.

Soils in this landscape position are highly variable with respect to depth, texture, color, and/or chemical properties. Because of extremely difficult access, statistically valid data could not be determined. Therefore physical and chemical properties of specific horizons are not given and interpretations such as erodibility are not determined. The taxonomic unit description is representative of what may be found in this landscape position.

48—Rock outcrop-Typic Torriorthents complex, Tonto Group and Redwall Formation, 15 to 60 percent slopes

Map Unit Setting

Landform(s): plateaus

Elevation: 2,500 to 3,500 feet (762 to 1,067 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

Land Resource Unit: 35-5 Colorado Plateau - Grand Canyon Corridor

Map Unit Composition

Rock outcrop: 60 percent

Typic Torriorthents and similar soils: 40 percent

Because of extreme inaccessibility resulting in minimum documentation, minor components could not be statistically validated. Major components were determined by documented site visits or were extrapolated from remote sensing.

Soil Properties and Qualities

Rock outcrop

Slope: 15 to 60 percent

Exposures of steep bedrock and cliffs, which are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

Typic Torriorthents soils

Taxonomic classification: Typic Torriorthents

Geomorphic position: occurs on colluvial slopes on ledges and canyon sidewalls of plateau escarpments

Parent material: colluvium derived from limestone, sandstone, and shale and/or residuum weathered from limestone

Slope: 15 to 60 percent

Surface cover

Biological crust

-cyanobacteria: 0 percent

-lichen: 0 percent

-moss: 0 percent

Chemical crust

-salt: 0 percent

-gypsum: 0 percent

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Physical cover

- canopy plant cover: 20 percent
- woody debris: 5 percent
- bare soil: 80 percent
- rock fragments: 0 percent

Depth to restrictive feature(s): 21 to 50 inches to bedrock, lithic

Drainage class: excessively 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 0.57 inches per hour (0.00 to 4.00 micrometers per second)

Available water capacity total inches: 1.5 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: medium

Hydrologic group: B

Ecological site name: Sedimentary Cliffs 6-10" p.z.

Ecological site number: R035XE516AZ

Present vegetation: *Ephedra*, shadscale saltbush, pricklypear

Land capability (non irrigated): 7c

Typical Profile

Typical pedon is from the Soil Survey of Grand Canyon Area, Arizona, Parts of Coconino and Mohave Counties.

Location

Geographic Coordinate System: 36° 26' 5.00" north, 111° 51' 13.00" west

A—0 to 10 inches (0 to 25 cm); strong brown (7.5YR 5/6) extremely stony loamy very fine sand, brown (7.5YR 4/4), moist; 5 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine roots; common very fine tubular pores; 15 percent gravel, 20 percent cobble, and 30 percent stone; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

C1—10 to 20 inches (25 to 51 cm); strong brown (7.5YR 5/6) extremely stony loamy very fine sand, brown (7.5YR 4/4), moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine tubular pores; 15 percent gravel, 20 percent cobble, and 30 percent stone; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

C2—20 to 30 inches (51 to 76 cm); strong brown (7.5YR 5/6) extremely stony loamy very fine sand, brown (7.5YR 4/4), moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine tubular pores; 15 percent gravel, 20 percent cobble, and 30 percent stone; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt irregular boundary.

R—30 inches (76 cm); unfractured, unweathered limestone bedrock.

Range in Characteristics

Typic Torriorthents have soil properties that vary outside of family class limits.

Soils in this landscape position are highly variable with respect to depth, texture, color, and/or chemical properties. Because of extremely difficult access, statistically valid data could not be determined. Therefore, physical and chemical properties of specific horizons are not given, and interpretations such as erodibility are not determined. The taxonomic unit description is representative of what may be found in this landscape position.

49—Santrick-Nalcase-Rock outcrop complex, 1 to 15 percent slopes

Map Unit Setting

Landform(s): dune fields, escarpments, structural benches
Elevation: 5,700 to 6,400 feet (1,737 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 12.0 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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Santrick and similar soils: 50 percent
Nalcase and similar soils: 25 percent
Rock outcrop: 10 percent
Minor components: 15 percent
-Mespun and similar soils
-Active dunes and sand sheets
-Gullied land

Soil Properties and Qualities

Santrick soils

Taxonomic classification: Siliceous, mesic Ustic Torripsamments
Geomorphic position: occurs on stabilized dunes and sand sheets in dune fields and on structural benches
Parent material: eolian sands derived from Navajo sandstone
Slope: 1 to 15 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: 50 percent
-woody debris: 12 percent
-bare soil: 60 percent
rock fragments: 0 percent
Depth to restrictive feature(s): 20 to 40 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: 1.6 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: C
Ecological site name: Sandy Upland 10-14" p.z.

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Ecological site number: R035XC315AZ

Present vegetation: sand sagebrush, *Ephedra*, other annual forbs, sand buckwheat, sandhill muhly, blue grama

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Navajo Mountain Area, Arizona, Parts of Apache, Coconino, and Navajo Counties.

Location

Geographic Coordinate System: 36° 35' 4.00" north, 111° 28' 26.00" west

C1—0 to 2 inches (0 to 5 cm); reddish yellow (7.5YR 6/6) fine sand, strong brown (7.5YR 4/6), moist; 4 percent clay; single grain; loose, nonsticky, nonplastic; few fine roots; few fine tubular pores; noneffervescent; neutral, pH 7.2; abrupt wavy boundary.

C2—2 to 7 inches (5 to 18 cm); brown (7.5YR 5/4) fine sand, brown (7.5YR 4/4), moist; 3 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine and few fine roots; few medium and fine tubular pores; noneffervescent; slightly alkaline, pH 7.4; clear wavy boundary.

C3—7 to 16 inches (18 to 41 cm); brown (7.5YR 5/4) fine sand, brown (7.5YR 4/4), moist; 3 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few fine and medium roots; few fine tubular pores; noneffervescent; slightly alkaline, pH 7.4; clear wavy boundary.

C4—16 to 23 inches (41 to 58 cm); brown (7.5YR 5/4) fine sand, strong brown (7.5YR 4/6), moist; 6 percent clay; massive; moderately hard, very friable, nonsticky, nonplastic; few fine to coarse roots; few fine tubular pores; noneffervescent; slightly alkaline, pH 7.4; very abrupt irregular boundary.

R—23 inches (58 cm); fractured, unweathered sandstone bedrock.

Range in Characteristics

Particle-size control section clay content: 3 to 7 percent

C horizon

Hue: 7.5YR, 10YR

Value: 4 to 7, dry or moist

Chroma: 4 or 6, dry or moist

Texture: sand, fine sand, loamy fine sand

Clay: 1 to 8 percent

Calcium carbonate equivalent: 0 to 4 percent

Rock fragments: 0 to 5 percent gravels

Reaction: neutral to moderately alkaline

Nalc case soils

Taxonomic classification: Siliceous, mesic Lithic Torripsamments

Geomorphic position: occurs on sand sheets in dune fields

Parent material: eolian sands derived from Navajo sandstone

Slope: 1 to 15 percent

Surface cover

Biological crust

-cyanobacteria: 0 percent

-lichen: 0 percent

-moss: 0 percent

Chemical crust

-salt: 0 percent

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-gypsum: 0 percent
Physical cover
-canopy plant cover: 35 percent
-woody debris: 5 percent
-bare soil: 70 percent
rock fragments: 0 percent
Depth to restrictive feature(s): 5 to 17 inches to bedrock, densic; 5 to 20 inches to bedrock, lithic
Drainage class: excessively drained
Ksat solum: 0.20 to 19.98 inches per hour (1.40 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: 0.5 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: medium
Hydrologic group: D
Ecological site name: Sandstone Upland 10-14" p.z.
Ecological site number: R035XC314AZ
Present vegetation: blue grama, Utah juniper, sandhill muhly
Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Navajo Mountain Area, Arizona, Parts of Apache, Coconino, and Navajo Counties.

Location

Geographic Coordinate System: 36° 29' 16.20" north, 111° 27' 59.00" west

C1—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) fine sand, brown (7.5YR 4/4), moist; 3 percent clay; single grain; loose, nonsticky, nonplastic; few very fine roots; few very fine tubular pores; noneffervescent; slightly alkaline, pH 7.4; clear wavy boundary.

C2—2 to 4 inches (5 to 10 cm); strong brown (7.5YR 4/6) fine sand, reddish brown (5YR 4/4), moist; 7 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; common very fine and fine roots; few very fine tubular pores; noneffervescent; slightly alkaline, pH 7.4; abrupt wavy boundary.

C3—4 to 7 inches (10 to 18 cm); strong brown (7.5YR 4/6) fine sand, reddish brown (5YR 4/4), moist; 4 percent clay; massive; moderately hard, friable, nonsticky, nonplastic; few very fine and fine roots; few very fine tubular pores; noneffervescent; neutral, pH 7.2; abrupt wavy boundary.

C4—7 to 10 inches (18 to 25 cm); brown (7.5YR 5/4) fine sand, brown (7.5YR 4/4), moist; 3 percent clay; massive; hard, firm, nonsticky, nonplastic; few very fine roots; few very fine tubular pores; noneffervescent; slightly alkaline, pH 7.4; very abrupt wavy boundary.

R—10 inches (25 cm); fractured, unweathered sandstone bedrock.

Range in Characteristics

Particle-size control section clay content: 2 to 6 percent

C horizon

Hue: 5YR, 7.5YR

Value: 4 to 7 dry, 3 to 6 moist

Chroma: 4 or 6, dry or moist

Texture: fine sand, sand

Clay: 1 to 8 percent
Calcium carbonate equivalent: 0 to 4 percent
EC: 0 to 3
Rock fragments: 0 to 5 percent gravels
Reaction: neutral to slightly alkaline

Some pedons do not have a Cd horizon.

Rock outcrop

Slope: 1 to 15 percent

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.

50—Sheppard-Moenkopie-Needle complex, 2 to 35 percent slopes

Map Unit Setting

Landform(s): structural benches
Elevation: 5,170 to 5,900 feet (1,575 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 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Sheppard and similar soils: 35 percent
Moenkopie and similar soils: 25 percent
Needle and similar soils: 25 percent
Minor Components: 15 percent
-Typic Torriorthents and similar soils
-Rock outcrop
-Lithic Haplocalcids and similar soils

Soil Properties and Qualities

Sheppard soils

Taxonomic classification: Mixed, mesic Typic Torripsamments
Geomorphic position: occurs on hill slopes of terraces and structural benches
Parent material: eolian sands over colluvium derived from sandstone
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: 65 percent

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-woody debris: 0 percent
-bare soil: 35 percent
rock fragments: 0 percent

Drainage class: excessively drained

Ksat solum: 1.98 to 99.92 inches per hour (14.00 to 705.00 micrometers per second)

Available water capacity total inches: 5.9 (moderate)

Shrink-swell potential: about 0.3 LEP (low)

Flooding hazard: none

Runoff class: medium

Hydrologic group: A

Ecological site name: Sandy Upland 6-10" p.z.

Ecological site number: R035XB217AZ

Present vegetation: Russian thistle, shadscale, *Ephedra*, blue grama, yucca

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 2' 5.50" north, 111° 5' 10.90" west

C1—0 to 2 inches (0 to 5 cm); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 5/6), moist; 3 percent clay; single grain; loose, nonsticky, nonplastic; few very fine roots; few very fine interstitial pores; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

C2—2 to 15 inches (5 to 38 cm); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 5/6), moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine interstitial pores; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual wavy boundary.

C3—15 to 38 inches (38 to 97 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/6), moist; 6 percent clay; massive; loose, nonsticky, nonplastic; few very fine roots; few very fine interstitial pores; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual wavy boundary.

C4—38 to 60 inches (97 to 153 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/6), moist; 6 percent clay; massive; loose, nonsticky, nonplastic; few very fine roots; few very fine interstitial pores; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

Range in Characteristics

Rock fragments of the control section: 0 to 10 percent gravels

Particle-size control section clay content: 3 to 8 percent

C horizon

Hue: 5YR, 2.5YR

Value: 4 to 6, dry or moist

Chroma: 4 to 6, dry or moist

Texture: fine sand, loamy fine sand, sand, loamy sand

Clay: 2 to 9 percent

Calcium carbonate equivalent: 10 to 20 percent

Rock fragments: 0 to 10 percent gravels

Reaction: moderately alkaline to strongly alkaline

Moenkopie soils

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

Geomorphic position: occurs on hill slopes of terraces and structural benches

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Parent material: colluvium over residuum weathered from sandstone

Slope: 5 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: 65 percent

-woody debris: 0 percent

-bare soil: 35 percent

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 2.00 inches per hour (1.41 to 14.11 micrometers per second)

Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.41 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: high

Hydrologic group: D

Ecological site name: Mudstone/Sandstone Hills 6-10" p.z.

Ecological site number: R035XB201AZ

Present vegetation: alkali sacaton, *Ephedra*, galleta, Russian thistle, shadscale

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 39' 49.20" north, 111° 0' 46.10" west

C1—0 to 2 inches (0 to 5 cm); reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4), moist; 15 percent clay; single grain; soft, very friable, very sticky, moderately plastic; few very fine roots; few very fine tubular pores; 10 percent channer; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear wavy boundary.

C2—2 to 4 inches (5 to 10 cm); reddish brown (2.5YR 4/3) loam, dark reddish brown (2.5YR 3/3), moist; 13 percent clay; moderate thin platy structure; very hard, friable, very sticky, very plastic; few very fine roots; few very fine tubular pores; 5 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 9.0; abrupt smooth boundary.

R—4 inches (10 cm); unfractured, unweathered sandstone and siltstone bedrock.

Range in Characteristics

Rock fragments of the control section: 4 to 13 percent gravels

Particle-size control section clay content: 11 to 18 percent

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C horizon

Hue: 2.5YR, 5YR

Value: 3 to 5, dry or moist

Chroma: 3 to 5, dry or moist

Texture: loam, sandy loam, fine sandy loam, loamy sand

Clay: 8 to 20 percent

Calcium carbonate equivalent: 10 to 20 percent

Rock fragments: 4 to 13 percent gravels

Reaction: moderately alkaline to strongly alkaline

Needle soils

Taxonomic classification: Mixed, mesic Lithic Torripsamments

Geomorphic position: occurs on hill slopes of terraces and structural benches

Parent material: eolian sands over residuum weathered from calcareous sandstone

Slope: 10 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: 65 percent

-woody debris: 0 percent

-bare soil: 35 percent

rock fragments

gravel: 10 percent

Depth to restrictive feature(s): 4 to 20 inches to bedrock, lithic

Drainage class: excessively drained

Ksat solum: 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)

Ksat restrictive layer: 0.00 to 0.20 inches per hour (0.00 to 1.41 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: very high

Hydrologic group: D

Ecological site name: Sandy Upland 6-10" p.z.

Ecological site number: R035XB217AZ

Present vegetation: *Ephedra*, galleta, rabbitbrush, winterfat, yucca

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 56' 18.40" north, 111° 7' 1.20" west

C1—0 to 3 inches (0 to 6 cm); light brown (7.5YR 6/3) loamy fine sand, brown (7.5YR 5/3), moist; 2 percent clay; single grain; loose, nonsticky, nonplastic; few very fine roots; few very fine interstitial pores; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

C2—3 to 15 inches (6 to 38 cm); brown (7.5YR 5/3) loamy fine sand, brown (7.5YR 4/3), moist; 5 percent clay; massive; loose, nonsticky, nonplastic; few very fine roots;

few very fine interstitial pores; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

C3—15 to 19 inches (38 to 47 cm); light yellowish brown (10YR 6/4) loamy sand, yellowish brown (10YR 5/4), moist; 2 percent clay; massive; loose, nonsticky, nonplastic; few very fine roots; few very fine interstitial pores; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

R—19 inches (47 cm); unfractured, unweathered sandstone and siltstone bedrock.

Range in Characteristics

Rock fragments of the control section: 0 to 10 percent gravels

Particle-size control section clay content: 3 to 6 percent

C horizon

Hue: 5YR, 7.5YR, 10YR

Value: 3 to 6, dry or moist

Chroma: 3 to 5, dry or moist

Texture: loamy sand, sand, sandy loam, loamy fine sand

Clay: 1 to 7 percent

Calcium carbonate equivalent: 10 to 15 percent

Rock fragments: 0 to 10 percent gravels

Reaction: moderately alkaline to strongly alkaline

51—Sheppard-Monue complex, 1 to 8 percent slopes

Map Unit Setting

Landform(s): plateaus, sand sheets

Elevation: 4,900 to 6,000 feet (1,493 to 1,829 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Sheppard and similar soils: 60 percent

Monue and similar soils: 30 percent

Minor Components: 10 percent

-Nakai and similar soils

-Ives and similar soils

Soil Properties and Qualities

Sheppard soils

Taxonomic classification: Mixed, mesic Typic Torripsamments

Geomorphic position: occurs on sandsheets on plateaus

Parent material: eolian sands

Slope: 1 to 8 percent

Surface cover:

Biological crust

-cyanobacteria: 0 percent

-lichen: 0 percent

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-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
rock fragments: 0 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: 5.4 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: A
Ecological site name: Sandy Upland 6-10" p.z.
Ecological site number: R035XB217AZ
Present vegetation: Indian ricegrass, needle and thread, black grama, galleta, blue grama, bottlebrush squirreltail, sand dropseed
Land capability (irrigated): 3e
Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 59' 28.70" north, 111° 11' 59.50" west

C1—0 to 15 inches (0 to 38 cm); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 4/6), moist; 4 percent clay; single grain; loose, nonsticky, nonplastic; common very fine and fine roots; common very fine and fine tubular pores; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; gradual smooth boundary.

C2—15 to 35 inches (38 to 89 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6), moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; common medium and few fine roots; common very fine irregular and fine tubular pores; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

C3—35 to 60 inches (89 to 152 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6), moist; 4 percent clay; massive; soft, very friable, nonsticky, nonplastic; few fine roots; common fine tubular pores; few carbonate masses in matrix; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

Range in Characteristics

Particle-size control section clay content: 2 to 8 percent

C horizon

Hue: 5YR, 7.5YR
Value: 6 dry, 4 moist
Chroma: 4 or 6, dry or moist
Texture: fine sand, loamy fine sand, loamy sand
Clay: 1 to 8 percent
Calcium carbonate equivalent: 0 to 10 percent
Reaction: moderately alkaline

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Monue soils

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids

Geomorphic position: occur on sandsheets on plateaus

Parent material:

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: 5 percent

-bare soil: 60 percent

rock fragments: 0 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: 4.9 (low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: low

Hydrologic group: B

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

Ecological site number: R035XB219AZ

Present vegetation: Indian ricegrass, black grama, blue grama, *Ephedra*

Land capability (irrigated): 3e

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 55' 34.30" north, 111° 9' 1.00" west

C—0 to 4 inches (0 to 10 cm); reddish yellow (7.5YR 6/6) loamy sand, strong brown (7.5YR 5/6), moist; 6 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine roots and fine roots; common fine interstitial pores; slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

Bw1—4 to 14 inches (10 to 36 cm); strong brown (7.5YR 5/6) sandy loam, strong brown (7.5YR 4/6), moist; 11 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common fine irregular pores; slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear wavy boundary.

Bw2—14 to 22 inches (36 to 56 cm); light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4), moist; 10 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common fine irregular pores; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear wavy boundary.

C—22 to 60 inches (56 to 152 cm); light brown (7.5YR 6/4) sand, brown (7.5YR 5/4), moist; 3 percent clay; single grain; loose, nonsticky, nonplastic; common very fine

roots; common fine interstitial pores; common carbonate, finely disseminated; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

Range in Characteristics

Particle-size control section clay content: 4 to 12 percent

C horizon

Hue: 5YR, 7.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: loamy sand, loamy fine sand
Clay: 2 to 8 percent
Calcium carbonate equivalent: 2 to 5 percent
Reaction: moderately alkaline

Bw horizon

Hue: 5YR, 7.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: sandy loam, fine sandy loam
Clay: 8 to 18 percent
Calcium carbonate equivalent: 2 to 10 percent
Reaction: moderately alkaline

C horizon

Hue: 5YR, 7.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: sand, loamy sand
Clay: 2 to 8 percent
Calcium carbonate equivalent: 2 to 10 percent
Reaction: moderately alkaline

Cambic horizon: the zone from 4 to 22 inches (10 to 56 cm), (Bw horizon)

Some pedons have a slight accumulation of sodium in the Bw horizon.

52—Sheppard-Psammaquents-Rock outcrop complex, 0 to 8 percent slopes

Map Unit Setting

Landform(s): plateaus

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 (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Sheppard and similar soils: 50 percent

Psammaquents and similar soils: 20 percent

Rock outcrop: 10 percent

Minor Components: 20 percent

- Needle and similar soils
- Fine-loamy, mixed, mesic Typic Haplargids

Soil Properties and Qualities

Sheppard soils

Taxonomic classification: Mixed, mesic Typic Torripsamments

Geomorphic position: occurs on summits and side slopes of stable 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: 40 percent

-woody debris: 10 percent

-bare soil: 50 percent

rock fragments: 0 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: 4.3 (low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very low

Hydrologic group: A

Ecological site name: Sandy Upland 6-10" p.z.

Ecological site number: R035XB217AZ

Present vegetation: sand sagebrush, broom snakeweed, *Ephedra*, rosemary mint, sandhill muhly, Indian ricegrass, narrowleaf yucca, sand dropseed

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 12' 2.00" north, 111° 13' 10.00" west

C—0 to 2 inches (0 to 5 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; many very fine roots; few very fine and fine vesicular pores; noneffervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Cy1—2 to 4 inches (5 to 10 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; many very fine roots; few fine tubular pores; common gypsum masses in matrix; noneffervescent, 2 percent gypsum; strongly alkaline, pH 8.6; abrupt smooth boundary.

Cy2—4 to 11 inches (10 to 28 cm); strong brown (7.5YR 5/6) fine sand, strong brown (7.5YR 4/6), moist; 3 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; many very fine and fine roots; few fine tubular pores; common gypsum masses in matrix; noneffervescent, 2 percent gypsum; strongly alkaline, pH 8.8; clear smooth boundary.

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Cy3—11 to 51 inches (28 to 130 cm); strong brown (7.5YR 5/6) fine sand, strong brown (7.5YR 4/6), moist; 3 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few medium, common very fine, and few fine roots; few fine tubular pores; common gypsum masses in matrix; noneffervescent, 2 percent gypsum; strongly alkaline, pH 8.6; gradual smooth boundary.

Cn—51 to 63 inches (130 to 160 cm); strong brown (7.5YR 5/6) loamy fine sand, strong brown (7.5YR 4/6), moist; 4 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; common medium, very fine, and fine roots; few fine tubular pores; common gypsum masses in matrix; noneffervescent, 2 percent gypsum; strongly alkaline, pH 8.8.

Range in Characteristics

Particle-size control section clay content: 1 to 6 percent

C horizon

Hue: 7.5YR
Value: 4 or 5, dry or moist
Chroma: 6, dry or moist
Texture: fine sand
Clay: 1 to 6 percent
Reaction: moderately alkaline

Cy horizon

Hue: 7.5YR
Value: 4 or 5, dry or moist
Chroma: 6, dry or moist
Texture: fine sand, loamy fine sand
Clay: 1 to 6 percent
Gypsum: 0 to 4 percent
SAR: 0 to 4
Reaction: moderately alkaline to strongly alkaline

Psammaquents soils

Taxonomic classification: Mixed, mesic Typic Psammaquents

Geomorphic position: occurs on interdunes

Parent material: eolian sands 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: 10 percent

-bare soil: 50 percent

rock fragments: 0 percent

Drainage class: poorly drained

Ksat solum: 0.57 to 19.98 inches per hour (4.00 to 141.00 micrometers per second)

Available water capacity total inches: 3.7 (low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: very rare

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Seasonal water table minimum depth: about 0 to 6 inches

Runoff class: negligible

Hydrologic group: A/D

Ecological site name: Sandy Seep 6-10" p.z. Sodic

Ecological site number: R035XB253AZ

Present vegetation: jimmyweed, alkali muhly, shadscale saltbush

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 12' 30.50" north, 111° 10' 59.30" west

An—0 to 2 inches (0 to 5 cm); yellow (10YR 8/6) fine sand, yellow (10YR 7/6), moist; 1 percent clay; moderate thin platy structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; very slightly effervescent, 1 percent calcium carbonate equivalent; very strongly alkaline, pH 9.2; abrupt smooth boundary.

C1—2 to 9 inches (5 to 23 cm); yellow (10YR 7/6) fine sand, brownish yellow (10YR 6/6), moist; 1 percent clay; single grain; loose, nonsticky, nonplastic; common very fine roots; noneffervescent; moderately alkaline, pH 8.3; clear smooth boundary.

C2—9 to 24 inches (23 to 61 cm); reddish yellow (7.5YR 6/6) fine sand, strong brown (7.5YR 5/6), moist; 1 percent clay; 2 percent mottles; massive; soft, loose, nonsticky, nonplastic; few very fine roots; 20 percent ironstone nodules in matrix; many iron concretions in matrix; noneffervescent; moderately alkaline, pH 8.3; clear smooth boundary.

C3—24 to 46 inches (61 to 117 cm); strong brown (7.5YR 5/6) fine sand, strong brown (7.5YR 4/6), moist; 1 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few iron concretions in matrix; noneffervescent; moderately alkaline, pH 8.3; diffuse smooth boundary.

2C4—46 to 52 inches (117 to 132 cm); very pale brown (10YR 7/4) sandy clay loam, light yellowish brown (10YR 6/4), moist; 28 percent clay; massive; hard, firm, very sticky, very plastic; many very fine vesicular pores; 10 percent clay depletions in matrix; noneffervescent; moderately alkaline, pH 8.3; diffuse smooth boundary.

3C5—52 to 60 inches (132 to 152 cm); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 5/6), moist; 1 percent clay; massive; moderately hard, very friable, nonsticky, nonplastic; noneffervescent; moderately alkaline, pH 8.3.

Range in Characteristics

Psammaquents have soil properties that vary outside of family class limits.

Particle-size control section clay content: 0 to 1 percent

An Horizon

Hue: 7.5YR, 10YR

Value: 7 or 8, dry or moist

Chroma: 6, dry or moist

Texture: fine sand

Clay: 0 to 1 percent

SAR: 15 to 25

EC: 5 to 25

Reaction: moderately alkaline to very strongly alkaline

C, 2C horizons

Hue: 5YR, 7.5YR, 10YR

Value: 5 to 7 dry, 4 to 6 moist
Chroma: 4 to 6, dry or moist
Texture: fine sand, sandy clay loam
Clay: 0 to 35 percent
Reaction: moderately alkaline

Rock outcrop

Slope: 0 to 15 percent

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.

53—Sheppard-Rock outcrop-Sheppard, moderately deep complex, 2 to 15 percent slopes

Map Unit Setting

Landform(s): dunes, plateaus
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 (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Sheppard and similar soils: 45 percent
Rock outcrop: 25 percent
Sheppard, moderately deep and similar soils: 20 percent
Minor Components: 10 percent
-Needle and similar soils
-Monue and similar soils

Soil Properties and Qualities

Sheppard soils

Taxonomic classification: Mixed, mesic Typic Torripsamments
Geomorphic position: occurs on sand sheets and stabilized dunes overlying sandstone
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: 20 percent
-woody debris: 0 percent
-bare soils: 80 percent
rock fragments: 0 percent
Drainage class: excessively drained

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Ksat solum: 1.98 to 19.98 inches per hour (14.00 to 141.00 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

Ecological site name: Sandy Upland 6-10" p.z.

Ecological site number: R035XB217AZ

Present vegetation: sand sagebrush, broom snakeweed, *Ephedra*, rosemary mint, sandhill muhly, Indian ricegrass, narrowleaf yucca, sand dropseed

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 11' 0.30" north, 111° 16' 57.10" west

A—0 to 7 inches (0 to 18 cm); reddish brown (5YR 5/4) loamy sand, reddish brown (5YR 4/4), moist; 6 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few medium, very fine, and fine roots; few fine irregular and common fine tubular pores; noneffervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C1—7 to 24 inches (18 to 61 cm); reddish brown (5YR 5/4) loamy sand, reddish brown (5YR 4/4), moist; 4 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few medium, very fine, and fine roots; few fine irregular and common fine tubular pores; very slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

C2—24 to 47 inches (61 to 119 cm); reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4), moist; 6 percent clay; massive; moderately hard, very friable, nonsticky, nonplastic; few very fine and fine roots; few fine irregular and common fine tubular pores; few gypsum masses in matrix; slightly effervescent, 3 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

C3—47 to 60 inches (119 to 152 cm); reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4), moist; 4 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; few fine tubular pores; few gypsum masses in matrix; slightly effervescent, 3 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

Range in Characteristics

Particle-size control section clay content: 2 to 10 percent

A, C horizons

Hue: 5YR, 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 or 6, dry or moist

Texture: fine sand, sand, loamy sand, or loamy fine sand

Clay: 2 to 10 percent

Calcium carbonate equivalent: 0 to 5 percent

Reaction: moderately alkaline to strongly alkaline

Some pedons have Cn horizons with slight salt accumulations and pH of 9.0.

Rock outcrop

Slope: 2 to 15 percent

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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.

Sheppard, moderately deep soils

Taxonomic classification: Mixed, mesic Typic Torripsamments

Geomorphic position: occurs on moderately deep sand sheets and stabilized dunes overlying sandstone

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: 20 percent

-woody debris: 0 percent

-bare soils: 80 percent

rock fragments: 0 percent

Depth to restrictive feature(s): 20 to 40 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: 0.00 to 0.20 inches per hour (0.00 to 1.41 micrometers per second)

Available water capacity total inches: 1.5 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very low

Hydrologic group: A

Ecological site name: Sandy Upland 6-10" p.z.

Ecological site number: R035XB217AZ

Present vegetation: alkali sacaton, Indian ricegrass, black greasewood, rubber rabbitbrush, *Ephedra*, galleta

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 12' 4.80" north, 111° 9' 25.10" west

C1—0 to 1 inch (0 to 3 cm); reddish yellow (7.5YR 6/6) loamy sand, brown (7.5YR 4/4), moist; 6 percent clay; single grain; loose, nonsticky, nonplastic; common very fine roots; common very fine interstitial pores; noneffervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

C2—1 inch to 14 inches (3 to 36 cm); brown (7.5YR 5/4) loamy sand, brown (7.5YR 4/4), moist; 4 percent clay; massive; soft, loose, nonsticky, nonplastic; common medium, very fine, and fine roots; common very fine interstitial pores; slightly effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

C3—14 to 19 inches (36 to 48 cm); white (10YR 8/1) loamy sand, light brownish gray (10YR 6/2), moist; 6 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; common very fine interstitial pores;

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strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual smooth boundary.

C4—19 to 33 inches (48 to 84 cm); reddish yellow (7.5YR 6/6) sand, brown (7.5YR 4/4), moist; 3 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine roots; common very fine interstitial pores; very slightly effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

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

Range in Characteristics

Sheppard, moderately deep differs from the series because it has a lithic contact between 20 to 40 inches, and hues of 10YR.

Particle-size control section clay content: 2 to 10 percent

A horizon

Hue: 7.5YR, 10YR
Value: 4 to 6, dry or moist
Chroma: 4 or 6, dry or moist
Texture: loamy sand
Clay: 2 to 10 percent
SAR: 0 to 4
Reaction: strongly alkaline

C horizon

Hue: 7.5YR, 10YR
Value: 5 to 8 dry, 4 to 6 moist
Chroma: 1 to 6 dry, 2 to 4 moist
Texture: loamy sand, sand
Clay: 2 to 10 percent
Calcium carbonate equivalent: 0 to 5 percent
SAR: 0 to 4
Reaction: strongly alkaline

Some pedons have Cn horizons with slight salt accumulations and pH of 9.0.

54—Shinume-Leupp-Rock outcrop complex, 4 to 35 percent slopes

Map Unit Setting

Landform(s): structural benches

Elevation: 5,000 to 5,450 feet (1,524 to 1,661 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Shinume and similar soils: 40 percent

Leupp and similar soils: 30 percent

Rock outcrop: 15 percent

Minor Components: 15 percent

-Sheppard and similar soils

- Typic Torriorthents and similar soils
- Typic Haplargids and similar soils

Soil Properties and Qualities

Shinume soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Torriorthents

Geomorphic position: occurs on backslopes on structural benches

Parent material: Moenkopi formation colluvium over residuum weathered from calcareous sandstone

Slope: 15 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: 60 percent

-woody debris: 0 percent

-bare soil: 40 percent

rock fragments

boulder: 2 percent

channer: 15 percent

flagstone: 30 percent

Depth to restrictive feature(s): 4 to 7 inches to bedrock, lithic

Drainage class: excessively 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: 0.5 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very high

Hydrologic group: D

Ecological site name: Mudstone/Sandstone Hills 6-10" p.z. CORA

Ecological site number: R035XB251AZ

Present vegetation: blackbrush, shadscale saltbush, *Ephedra*, galleta

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 11' 48.00" north, 111° 32' 7.00" west

A—0 to 1 inch (0 to 2 cm); yellowish red (5YR 4/6) extremely flaggy very fine sandy loam, (5YR 3/6), moist; 5 percent clay; strong medium platy structure; slightly hard, friable, nonsticky, nonplastic; few very fine roots; many very fine and fine vesicular pores; 30 percent channer and 30 percent flagstone; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C—1 inch to 5 inches (2 to 13 cm); reddish brown (2.5YR 4/4) very channery fine sandy loam, dark reddish brown (2.5YR 3/4), moist; 18 percent clay; moderate

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thick platy structure; slightly hard, friable, moderately sticky, moderately plastic; few coarse roots; few medium tubular pores; 45 percent channer; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

R—5 inches (13 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 37 to 53 percent channers and flagstones
Particle-size control section clay content: 9 to 18 percent

A horizon

Hue: 5YR
Value: 4 dry, 3 moist
Chroma: 6, dry or moist
Texture: very fine sandy loam
Clay: 5 to 10 percent
Calcium carbonate equivalent: 10 to 25 percent
Rock fragments: 50 to 70 percent channers and flagstones
Reaction: moderately alkaline

C horizon

Hue: 2.5YR
Value: 4 dry, 3 moist
Chroma: 4, dry or moist
Texture: fine sandy loam
Clay: 10 to 20 percent
Calcium carbonate equivalent: 10 to 25 percent
Rock fragments: 35 to 50 percent channers
Reaction: moderately alkaline

Leupp soils

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

Geomorphic position: occurs on summits on structural benches

Parent material: Moenkopi formation colluvium over residuum weathered from calcareous sandstone

Slope: 4 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: 60 percent
-woody debris: 0 percent
-bare soil: 40 percent
rock fragments
gravel: 30 percent

Depth to restrictive feature(s): 5 to 8 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)

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Ksat restrictive layer: 0.00 to 0.57 inches per hour (0.00 to 4.00 micrometers per second)

Available water capacity total inches: 0.7 (very low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: very high

Hydrologic group: D

Ecological site name: Shallow Loamy 6-10" p.z. Calcareous

Ecological site number: R035XB226AZ

Present vegetation: blackbrush, *Ephedra*, shadscale saltbush, porcupine pricklypear, galleta

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 5' 15.00" north, 111° 34' 7.00" west

A—0 to 2 inches (0 to 5 cm); light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 5/4), moist; 18 percent clay; strong thick platy structure; soft, very friable, moderately sticky, moderately plastic; few very fine roots; many medium and very fine and common fine vesicular pores; 10 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bw—2 to 4 inches (5 to 10 cm); reddish brown (5YR 5/4) gravelly clay loam, reddish brown (5YR 4/4), moist; 33 percent clay; strong very fine granular structure; loose, moderately sticky, moderately plastic; common very fine roots; many very fine irregular pores; 30 percent gravel; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

C—4 to 7 inches (10 to 18 cm); reddish brown (5YR 5/4) gravelly sandy clay loam, reddish brown (5YR 4/4), moist; 28 percent clay; weak very fine subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; many very fine roots; many very fine irregular pores; 30 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; very abrupt smooth boundary.

R—7 inches (18 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 18 to 34 percent gravels

Particle-size control section clay content: 24 to 30 percent

A horizon

Hue: 5YR

Value: 6 dry, 5 moist

Chroma: 4, dry or moist

Texture: sandy loam, loam

Clay: 14 to 19 percent

Calcium carbonate equivalent: 10 to 25 percent

Rock fragments: 0 to 15 percent gravels

Reaction: moderately alkaline

Bw horizon

Hue: 5YR

Value: 5 dry, 4 moist

Chroma: 4, dry or moist

Texture: sandy loam, clay loam

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Clay: 28 to 34 percent
Calcium carbonate equivalent: 10 to 15 percent
Rock fragments: 15 to 35 percent gravels
Reaction: moderately alkaline

C horizon

Hue: 5YR
Value: 5 dry, 4 moist
Chroma: 4, dry or moist
Texture: sandy clay loam, loam
Clay: 20 to 34 percent
Calcium carbonate equivalent: 10 to 25 percent
Rock fragments: 15 to 35 percent gravels
Reaction: moderately alkaline

Rock outcrop

Slope: 15 to 60 percent

Exposures of steep to rolling bedrock, typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

55—Shoegame family, 1 to 5 percent slopes

Map Unit Setting

Landform(s): mesas
Elevation: 5,860 to 5,940 feet (1,786 to 1,812 meters)
Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau Sagebrush-Grasslands

Map Unit Composition

Shoegame family and similar soils: 85 percent
Minor Components: 15 percent
-Mido and similar soils
-Coarse-loamy Ustic Torriorthents and similar soils

Soil Properties and Qualities

Shoegame family soils

Taxonomic classification: Sandy-skeletal, mixed, mesic Ustic Haplocalcids
Geomorphic position: occurs on mesa summits
Parent material: eolian sands derived from sandstone over Carmel Formation gravelly residuum weathered from sedimentary rock
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

Soil Survey of Little Colorado River Area, Arizona

Physical cover

- canopy plant cover: 20 percent
 - woody debris: 5 percent
 - bare soil: 70 percent
- rock fragments
gravel: 10 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: 7.9 (high)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: very low

Hydrologic group: A

Ecological site name: Sandy Upland 10-14" p.z. Limy, Gravelly

Ecological site number: R035XC345AZ

Present vegetation: galleta, Indian ricegrass, narrowleaf yucca, *Ephedra*, Utah juniper

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 14' 23.60" north, 111° 0' 54.00" west

C1—0 to 3 inches (0 to 8 cm); yellowish red (5YR 5/6) sand, reddish brown (5YR 4/4), moist; 4 percent clay; single grain; loose, nonsticky, nonplastic; few very fine and fine roots; few very fine interstitial pores; 10 percent gravel; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; gradual smooth boundary.

C2—3 to 16 inches (8 to 41 cm); yellowish red (5YR 5/6) gravelly sand, reddish brown (5YR 4/4), moist; 4 percent clay; weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few coarse and common very fine and fine roots; common very fine and fine tubular pores; 15 percent gravel; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bk—16 to 38 inches (41 to 97 cm); pink (5YR 7/4) very gravelly sand, light reddish brown (5YR 6/4), moist; 7 percent clay; weak medium subangular blocky structure; hard, friable, nonsticky, nonplastic; few very fine and fine roots; few very fine and fine vesicular pores; common carbonate nodules in matrix and common carbonate concretions on bottom of rock fragments; 30 percent gravel and 10 percent cobble; violently effervescent, 16 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; gradual wavy boundary.

Bkq1—38 to 52 inches (97 to 132 cm); pinkish gray (5YR 7/2) very gravelly sand, pinkish gray (5YR 6/2), moist; 4 percent clay; weak medium subangular blocky structure; hard, friable, nonsticky, nonplastic; few very fine and fine roots; common very fine and fine vesicular pores; common carbonate nodules in matrix and few silica concretions on bottom of rock fragments and common carbonate concretions on bottom of rock fragments; 40 percent gravel and 10 percent cobble; violently effervescent, 20 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; gradual wavy boundary.

Bkq2—52 to 60 inches (132 to 152 cm); pinkish gray (5YR 7/2) very gravelly loamy sand, pinkish gray (5YR 6/2), moist; 7 percent clay; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine and fine roots; common very fine and fine irregular pores; common carbonate nodules in matrix and

few silica concretions on bottom of rock fragments and common carbonate concretions on bottom of rock fragments; 25 percent gravel and 10 percent cobble; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

Range in Characteristics

Shoegame family differs from the series because the series has a depth to calcic horizon of 3 to 10 inches, hues of 10YR and 7.5YR, and is on stream terraces.

Rock fragments of the control section: 35 to 56 percent gravels and cobbles
Particle-size control section clay content: 4 to 8 percent

C horizon

Hue: 5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: sand, loamy sand
Clay: 3 to 7 percent
Calcium carbonate equivalent: 5 to 15 percent
SAR: 0 to 5
Rock fragments: 5 to 20 percent gravels
Reaction: moderately alkaline

Bk horizon

Hue: 5YR
Value: 6 or 7 dry, 5 or 6 moist
Chroma: 3 or 4, dry or moist
Texture: sand, loamy sand
Clay: 4 to 8 percent
Calcium carbonate equivalent: 15 to 25 percent
SAR: 0 to 5
Rock fragments: 25 to 65 percent gravel and cobbles
Reaction: moderately alkaline

Bkq horizon

Hue: 5YR
Value: 6 or 7 dry, 5 or 6 moist
Chroma: 2, dry or moist
Texture: loamy sand, sand
Clay: 3 to 12 percent
Calcium carbonate equivalent: 15 to 25 percent
SAR: 0 to 5
Rock fragments: 20 to 70 percent gravels and cobbles
Reaction: moderately alkaline to strongly alkaline

Calcic horizon: the zone from 16 to 60 inches (41 to 152 cm), (Bk and Bkq horizons)

Some pedons have calcium carbonate pendants and thick coatings on gravel.

Some pedons have slightly hard to hard silica cementation of sand grains and gravel.

56—Shorthair-Moenkopie complex, 2 to 15 percent slopes

Map Unit Setting

Landform(s): structural benches

Elevation: 4,340 to 5,040 feet (1,323 to 1,537 meters)

Soil Survey of Little Colorado River Area, Arizona

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Shorthair and similar soils: 60 percent
Moenkopie and similar soils: 25 percent
Minor Components: 15 percent
-Rock outcrop
-Sheppard and similar soils
-Typic Natrargids and similar soils

Soil Properties and Qualities

Shorthair soils

Taxonomic classification: Loamy, mixed, superactive, mesic Lithic Natrargids
Geomorphic position: occurs on backslopes and footslopes on structural benches
Parent material: slope alluvium over residuum weathered from limestone and 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: 10 percent
-woody debris: 5 percent
-bare soil: 85 percent
rock fragments
gravel: 30 percent
Depth to restrictive feature(s): 8 to 12 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: 1.1 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: very rare
Ponding hazard: rare
Runoff class: very high
Hydrologic group: D
Ecological site name: Loamy Wash 6-10" p.z. Saline
Ecological site number: R035XB211AZ
Present vegetation: alkali sacaton, mound saltbush, sixweeks fescue
Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 56' 2.90" north, 111° 19' 28.00" west

A—0 to 2 inches (0 to 5 cm); light reddish brown (5YR 6/3) sandy loam, reddish brown (5YR 5/3), moist; 10 percent clay; weak medium platy structure; soft, very friable, nonsticky, nonplastic; few very fine roots; common fine interstitial pores; 10 percent gravel; violently effervescent, 13 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt wavy boundary.

Btn—2 to 8 inches (5 to 20 cm); reddish brown (2.5YR 5/4) sandy clay loam, reddish brown (2.5YR 4/3), moist; 26 percent clay; strong coarse columnar structure; hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; few very fine irregular pores; common clay films on all faces of peds and common clay bridges between sand grains; 5 percent gravel; violently effervescent, 13 percent calcium carbonate equivalent; very strongly alkaline, pH 9.2; abrupt smooth boundary.

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

Range in Characteristics

Rock fragments of the control section: 0 to 10 percent gravels
Particle-size control section clay content: 24 to 28 percent

A horizon

Hue: 5YR, 2.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 3 or 4, dry or moist
Texture: sandy loam, loamy sand
Clay: 8 to 12 percent
Calcium carbonate equivalent: 5 to 15 percent
SAR: 5 to 12
Rock fragments: 5 to 15 percent gravels
Reaction: strongly alkaline

Btn horizon

Hue: 5YR, 2.5YR
Value: 5 to 6 dry, 4 or 5 moist
Chroma: 3 or 4, dry or moist
Texture: sandy clay loam, sandy loam
Clay: 24 to 28 percent
Calcium carbonate equivalent: 5 to 15 percent
SAR: 13 to 20
Rock fragments: 0 to 10 percent
Reaction: very strongly alkaline

Natric horizon: the zone from 2 to 8 inches (5 to 20 cm), (Btn horizon)

Moenkopie soils

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

Geomorphic position: occurs on summits and shoulders on structural benches

Parent material: residuum weathered from limestone and sandstone

Slope: 4 to 15 percent

Surface cover:

Biological crust
-cyanobacteria: 0 percent

Soil Survey of Little Colorado River Area, Arizona

-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
rock fragments
gravel: 20 percent
Depth to restrictive feature(s): 8 to 12 inches to bedrock, lithic
Drainage class: somewhat excessively 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: 0.7 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: very rare
Runoff class: very high
Hydrologic group: D
Ecological site name: Sandstone/Shale Upland 6-10" p.z.
Ecological site number: R035XB215AZ
Present vegetation: alkali sacaton, mound saltbush, sixweeks fescue
Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 55' 40.60" north, 111° 18' 34.10" west

C1—0 to 3 inches (0 to 8 cm); light reddish brown (5YR 6/4) gravelly loamy sand, reddish brown (5YR 5/4), moist; 7 percent clay; weak medium platy parts to single grain structure; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine irregular pores; 15 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; gradual smooth boundary.

C2—3 to 9 inches (8 to 23 cm); light reddish brown (5YR 6/4) gravelly sandy loam, reddish brown (5YR 5/4), moist; 12 percent clay; weak very fine platy structure; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine irregular pores; 20 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear wavy boundary.

C3—9 to 10 inches (23 to 25 cm); reddish brown (5YR 5/4) gravelly sandy loam, reddish brown (5YR 4/4), moist; 14 percent clay; weak medium prismatic parts to weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine tubular pores; few clay bridges between sand grains; common carbonate nodules in matrix; 30 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; abrupt smooth boundary.

R—10 inches (25 cm); unfractured, unweathered limestone and sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 13 to 27 percent gravels

Particle-size control section clay content: 9 to 13 percent

C horizon

Hue: 5YR, 2.5YR
Value: 4 to 6, dry or moist
Chroma: 3 or 4, dry or moist
Texture: loamy sand, sandy loam
Clay: 5 to 16 percent
Calcium carbonate equivalent: 5 to 15 percent
SAR: 0 to 4
Rock fragments: 10 to 30 percent gravels
Reaction: moderately alkaline to strongly alkaline

57—Shorthair-Rock outcrop-Sheppard complex, 2 to 15 percent slopes

Map Unit Setting

Landform(s): structural benches
Elevation: 4,360 to 5,140 feet (1,328 to 1,568 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub-Grasslands

Map Unit Composition

Shorthair and similar soils: 40 percent
Rock outcrop: 30 percent
Sheppard and similar soils: 15 percent
Minor Components: 15 percent
-Typic Natrargids and similar soils
-Tsaya and similar soils

Soil Properties and Qualities

Shorthair soils

Taxonomic classification: Loamy, mixed, superactive, mesic Lithic Natrargids
Geomorphic position: occurs on backslopes and shoulders on structural benches
Parent material: alluvium derived from sandstone over residuum weathered 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: 5 percent
-bare soil: 70 percent
rock fragments

Soil Survey of Little Colorado River Area, Arizona

cobble: 2 percent
chanter: 30 percent
Depth to restrictive feature(s): 8 to 18 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: 0.00 to 0.20 inches per hour (0.00 to 1.41 micrometers per second)
Available water capacity total inches: 1.4 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Ponding hazard: rare
Runoff class: low
Hydrologic group: D
Ecological site name: Sandstone Upland 6-10" p.z. Very Shallow
Ecological site number: R035XB204AZ
Present vegetation: alkali jimmyweed, alkali sacaton, desert globemallow, Douglas rabbitbrush, *Ephedra*, galleta, Indian ricegrass, manyflowered mentzelia, mound saltbush, sand sagebrush
Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 3' 20.50" north, 111° 18' 57.60" west

B_{tn}—0 to 4 inches (0 to 10 cm); yellowish red (5YR 4/6) sandy clay loam, yellowish red (5YR 5/6), moist; 24 percent clay; moderate medium prismatic structure; very hard, firm, slightly sticky, slightly plastic; common medium and very fine roots; common very fine and fine tubular pores; few clay films on all faces of peds and few clay bridges between sand grains; 5 percent chanter; strongly effervescent, 5 percent calcium carbonate equivalent; very strongly alkaline, pH 9.2; clear wavy boundary.

C_n—4 to 11 inches (10 to 28 cm); yellowish red (5YR 4/6) sandy loam, yellowish red (5YR 5/6), moist; 17 percent clay; weak coarse subangular blocky structure; hard, friable, nonsticky, nonplastic; common medium, very fine and fine roots; common very fine and fine tubular pores; slightly effervescent, 5 percent calcium carbonate equivalent; very strongly alkaline, pH 9.4; abrupt smooth boundary.

R—11 inches (28 cm); unfractured, unweathered sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 0 to 10 percent channers

Particle-size control section clay content: 18 to 30 percent

B_{tn} horizon

Hue: 5YR, 2.5YR

Value: 4 to 6 dry, 4 or 5 moist

Chroma: 4 or 6, dry or moist

Texture: sandy clay loam, sandy loam

Clay: 18 to 30 percent

Calcium carbonate equivalent: 2 to 10 percent

SAR: 13 to 20

Rock fragments: 0 to 10 percent channers

Reaction: strongly alkaline to very strongly alkaline

C_n horizon

Hue: 5YR, 2.5YR

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Value: 4 to 6 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: sandy loam, sandy clay loam
Clay: 12 to 22 percent
Calcium carbonate equivalent: 2 to 10 percent
SAR: 5 to 12
Rock fragments: 0 to 10 percent channers
Reaction: strongly alkaline to very strongly alkaline

Natric horizon: the zone from 0 to 4 inches (0 to 10 cm), (Btn horizon)

Some pedons have thin A or surface C horizons, usually less than 2 inches.

Rock outcrop

Slope: 15 to 35 percent

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.

Sheppard soils

Taxonomic classification: Mixed, mesic Typic Torripsamments

Geomorphic position: occurs on summits and shoulders on structural benches

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: 35 percent

-woody debris: 5 percent

-bare soil: 60 percent

rock fragments: 0 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: 3.6 (low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Ponding hazard: rare

Runoff class: negligible

Hydrologic group: A

Ecological site name: Sandy Upland 6-10" p.z. Sodic

Ecological site number: R035XB223AZ

Present vegetation: alkali sacaton, globemallow, Indian ricegrass, rubber rabbitbrush, sand sagebrush

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 35° 41' 51.80" north, 111° 7' 5.60" west

C1—0 to 4 inches (0 to 10 cm); yellowish red (5YR 5/6) sand, yellowish red (5YR 4/6), moist; 2 percent clay; single grain; loose, nonsticky, nonplastic; common very fine and

fine roots; common fine interstitial pores; noneffervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

C2—4 to 30 inches (10 to 76 cm); yellowish red (5YR 5/6) sand, yellowish red (5YR 4/6), moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine roots; common very fine interstitial pores; noneffervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

C3—30 to 60 inches (76 to 152 cm); yellowish red (5YR 5/6) sand, yellowish red (5YR 4/6), moist; 4 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine interstitial pores; noneffervescent; strongly alkaline, pH 8.8.

Range in Characteristics

Particle-size control section clay content: 1 to 6 percent

C horizon

Hue: 5YR, 2.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 or 6, dry or moist

Texture: sand, loamy sand, fine sand

Clay: 1 to 6 percent

SAR: 0 to 12

Reaction: moderately alkaline to strongly alkaline

Some pedons have Cn horizons with clay values up to 14 below the particle size control section.

58—Somorent family-Leupp-Bluechief complex, 5 to 60 percent slopes

Map Unit Setting

Landform(s): fan terraces, hills, plateaus

Elevation: 5,300 to 5,800 feet (1,615 to 1,768 meters)

Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)

Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)

Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)

Frost-free period: 150 to 180 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Somorent family and similar soils: 35 percent

Leupp and similar soils: 30 percent

Bluechief and similar soils: 20 percent

Minor Components: 15 percent

-Fine-loamy Typic Haplargids and similar soils

-Sheppard and similar soils

Soil Properties and Qualities

Somorent family soils

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Typic Torriorthents

Geomorphic position: occurs on erosional remnants on hills

Soil Survey of Little Colorado River Area, Arizona

Parent material: eolian sands over slope alluvium derived from sandstone and shale residuum weathered from sandstone

Slope: 15 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: 20 percent

-woody debris: 0 percent

-bare soil: 80 percent

rock fragments

gravel: 5 percent

Depth to restrictive feature(s): 5 to 20 inches to bedrock, paralithic

Drainage class: 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 1.41 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: very high

Hydrologic group: D

Ecological site name: Mudstone/Sandstone Hills 6-10" p.z.

Ecological site number: R035XB201AZ

Present vegetation: galleta, Bigelow sagebrush, Indian ricegrass, alkali sacaton, black grama, blue grama, needle and thread, shadscale saltbush

Land capability (non irrigated): 7c

Typical Profile

Typical pedon is from the Soil Survey of Fort Defiance Area, Parts of Apache and Navajo Counties, Arizona, and McKinley and San Juan Counties, New Mexico.

Location

Geographic Coordinate System: 35° 16' 24.00" north, 110° 26' 38.00" west

A—0 to 3 inches (0 to 8 cm); reddish yellow (5YR 6/6) clay loam, yellowish red (5YR 4/6), moist; 30 percent clay; weak very fine granular structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; common very fine tubular pores; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C—3 to 8 inches (8 to 20 cm); reddish yellow (5YR 6/6) clay loam, yellowish red (5YR 4/6), moist; 32 percent clay; massive; hard, friable, moderately sticky, moderately plastic; common very fine roots; common very fine tubular pores; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

CR—8 inches (20 cm); unfractured, weathered shale bedrock.

Range in Characteristics

Somorent family differs from the series because it has clay ranges from 28 to 40 percent, clay loam textures, and hues of 5YR and 2.5YR, and is very shallow to shallow.

Particle-size control section clay content: 29 to 40 percent

A horizon

Hue: 5YR, 2.5YR
Value: 4 to 6, dry or moist
Chroma: 4 or 6, dry or moist
Texture: clay loam, sandy clay loam
Clay: 28 to 40 percent
Calcium carbonate equivalent: 10 to 25 percent
SAR: 0 to 4
Reaction: moderately alkaline

C horizon

Hue: 5YR, 2.5YR
Value: 3 to 6, dry or moist
Chroma: 4 or 6, dry or moist
Texture: clay loam, sandy clay loam, loam
Clay: 30 to 40 percent
Calcium carbonate equivalent: 10 to 25 percent
SAR: 0 to 4
Reaction: moderately alkaline to strongly alkaline

Leupp soils

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

Geomorphic position: occurs on plateaus

Parent material: residuum weathered from sandstone and shale

Slope: 8 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: 20 percent
-woody debris: 0 percent
-bare soil: 80 percent
rock fragments
gravel: 15 percent

Depth to restrictive feature(s): 5 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: 0.01 to 2.00 inches per hour (0.10 to 14.11 micrometers per second)

Available water capacity total inches: 1.9 (very low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: high

Soil Survey of Little Colorado River Area, Arizona

Hydrologic group: D

Ecological site name: Sandstone/Shale Upland 6-10" p.z.

Ecological site number: R035XB215AZ

Present vegetation: galleta, black grama, Bigelow sagebrush, Indian ricegrass, *Sporobolus*, blue grama, *Ephedra*, needle and thread

Land capability (non irrigated): 7c

Typical Profile

Typical pedon is from the Soil Survey of Fort Defiance Area, Parts of Apache and Navajo Counties, Arizona, and McKinley and San Juan Counties, New Mexico.

Location

Geographic Coordinate System: 35° 26' 47.00" north, 110° 3' 40.00" west

A—0 to 2 inches (0 to 5 cm); reddish brown (5YR 5/4) gravelly clay loam, reddish brown (5YR 4/3), moist; 30 percent clay; weak fine granular structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; common very fine irregular and common fine tubular pores; 25 percent gravel; slightly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C1—2 to 7 inches (5 to 18 cm); reddish brown (5YR 5/4) gravelly clay loam, reddish brown (5YR 4/3), moist; 30 percent clay; massive; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; common fine tubular pores; 30 percent gravel; slightly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C2—7 to 10 inches (18 to 25 cm); reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/3), moist; 28 percent clay; massive; slightly hard, firm, slightly sticky, slightly plastic; common very fine roots; common very fine irregular pores; slightly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

R—10 inches (25 cm); fractured, unweathered sandstone bedrock.

Range in Characteristics

Rock fragments of the control section: 13 to 26 percent gravels

Particle-size control section clay content: 26 to 40 percent

A horizon

Hue: 5YR, 7.5YR

Value: 5 to 7 dry, 4 or 5 moist

Chroma: 2 to 6, dry or moist

Texture: clay loam, sandy clay loam

Clay: 28 to 40 percent

Calcium carbonate equivalent: 2 to 10 percent

Rock fragments: 15 to 35 percent gravels

Reaction: moderately alkaline

C horizon

Hue: 5YR, 7.5YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 2 to 6, dry or moist

Texture: clay loam, sandy clay loam

Clay: 20 to 40 percent

Calcium carbonate equivalent: 2 to 10 percent

Rock fragments: 0 to 40 percent gravels

Reaction: moderately alkaline to strongly alkaline

Bluechief soils

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocalcids

Geomorphic position: occurs on structural benches on plateaus

Parent material: eolian sands over slope alluvium derived from sandstone and shale over residuum weathered from sandstone

Slope: 5 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: 20 percent

-woody debris: 0 percent

-bare soil: 80 percent

rock fragments: 0 percent

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: 0.20 to 2.00 inches per hour (1.40 to 14.10 micrometers per second)

Available water capacity total inches: 5.5 (moderate)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: medium

Hydrologic group: C

Ecological site name: Sandy Loam Upland 6-10" p.z. Calcareous

Ecological site number: R035XB235AZ

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

Land capability (non irrigated): 7c

Typical Profile

Typical pedon is from the Soil Survey of Fort Defiance Area, Parts of Apache and Navajo Counties, Arizona, and McKinley and San Juan Counties, New Mexico.

Location

Geographic Coordinate System: 36° 52' 45.00" north, 109° 39' 20.00" west

A—0 to 2 inches (0 to 5 cm); yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6), moist; 15 percent clay; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine roots; common fine irregular pores; strongly effervescent, 15 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bw1—2 to 8 inches (5 to 20 cm); yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6), moist; 15 percent clay; weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; common fine irregular pores; strongly effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; abrupt smooth boundary.

Bw2—8 to 18 inches (20 to 46 cm); yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6), moist; 15 percent clay; moderate medium subangular blocky structure; slightly

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hard, very friable, nonsticky, nonplastic; common very fine and fine roots; common fine irregular pores; strongly effervescent, 15 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bw3—18 to 24 inches (46 to 61 cm); yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6), moist; 15 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common medium, very fine, and fine roots; common fine irregular pores; 5 percent gravel; strongly effervescent, 25 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bk1—24 to 30 inches (61 to 76 cm); yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6), moist; 10 percent clay; moderate medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common medium, very fine, and fine roots; common fine irregular pores; common carbonate concretions on bottom of rock fragments; 10 percent gravel; violently effervescent, 25 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bk2—30 to 38 inches (76 to 97 cm); light reddish brown (5YR 6/4) loam, yellowish red (5YR 5/6), moist; 15 percent clay; massive; slightly hard, very friable, nonsticky, nonplastic; common medium, very fine, and fine roots; common fine irregular pores; common carbonate concretions on bottom of rock fragments; 12 percent gravel; violently effervescent, 25 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; abrupt smooth boundary.

R—38 inches (97 cm); fractured, unweathered sandstone bedrock.

Range in Characteristics

Particle-size control section clay content: 9 to 18 percent

A horizon

Hue: 7.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: clay loam, sandy clay loam, loam
Clay: 15 to 40 percent
Calcium carbonate equivalent: 10 to 25 percent
Reaction: slightly alkaline

Bw horizon

Hue: 5YR, 7.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: loam, fine sandy loam, sandy loam
Clay: 10 to 20 percent
Calcium carbonate equivalent: 10 to 25 percent
Reaction: slightly alkaline to moderately alkaline

Bk horizon

Hue: 7.5YR, 10YR
Value: 6 to 8 dry, 5 to 7 moist
Chroma: 2 to 4, dry or moist
Texture: loam, sandy loam, fine sandy loam
Clay: 5 to 20 percent
Calcium carbonate equivalent: 15 to 30 percent
Rock fragments: 0 to 15 percent gravels
Reaction: slightly alkaline

Calcic horizon: the zone from 24 to 38 inches (61 to 97 cm), (Bk horizon)

59—Suzmayne very cobbly sandy loam, 35 to 60 percent slopes

Map Unit Setting

Landform(s): plateaus

Elevation: 6,390 to 6,800 feet (1,948 to 2,073 meters)

Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)

Mean annual air temperature: 46 to 50 degrees F (8.0 to 10.0 degrees C)

Mean annual soil temperature: 48 to 52 degrees F (9.1 to 11.1 degrees C)

Frost-free period: 120 to 150 days

Major Land Resource Area: 35 - Colorado Plateau

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

Map Unit Composition

Suzmayne and similar soils: 80 percent

Minor Components: 20 percent

- Gladel and similar soils
- Coarse-loamy Aridic Ustorthents
- Loamy Aridic Lithic Ustorthents

Soil Properties and Qualities

Suzmayne soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Aridic Ustorthents

Geomorphic position: occurs on steep ridges, canyons, and structural benches.

Parent material: colluvium derived from limestone and sandstone over residuum weathered from limestone and sandstone

Slope: 35 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: 5 percent
- bare soil: 5 percent
- rock fragments
 - gravel: 20 percent
 - cobble: 20 percent
 - stone: 20 percent
 - boulder: 5 percent

Depth to restrictive feature(s): 20 to 31 inches to bedrock, lithic

Drainage class: well drained

Ksat solum: 5.81 to 99.92 inches per hour (41.00 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: 1.6 (very low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

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Runoff class: medium

Hydrologic group: B

Ecological site name: Limestone Hills 14-18" p.z.

Ecological site number: R035XG708AZ

Present vegetation: black sagebrush, blue grama, cactus, cheatgrass, needle and thread, pinyon, Stansbury cliffrose, western wheatgrass, Wyoming big sagebrush

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 35° 55' 48.80" north, 111° 42' 24.20" west

A—0 to 5 inches (0 to 13 cm); brown (7.5YR 5/3) very cobbly sandy loam, brown (7.5YR 4/3), moist; 14 percent clay; single grain; soft, very friable, nonsticky, slightly plastic; few medium and common very fine and fine roots; common very fine interstitial pores; 15 percent gravel and 20 percent cobble; slightly effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; gradual smooth boundary.

C1—5 to 17 inches (13 to 43 cm); brown (7.5YR 4/4) very cobbly sandy loam, brown (7.5YR 4/3), moist; 12 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; few medium and common very fine roots; common very fine tubular pores; 15 percent gravel, 25 percent cobble, and 5 percent stone; slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; gradual smooth boundary.

C2—17 to 24 inches (43 to 61 cm); brown (7.5YR 5/4) very cobbly fine sandy loam, brown (7.5YR 4/4), moist; 15 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine tubular pores; 15 percent gravel, 30 percent cobble, and 5 percent stone; very slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

R—24 inches (61 cm); unfractured, unweathered limestone bedrock.

Range in Characteristics

Rock fragments of the control section: 35 to 70 percent gravels, cobbles, and stones
Particle-size control section clay content: 12 to 17 percent

A horizon

Hue: 7.5YR, 5YR

Value: 4 or 5 dry, 2 to 4 moist

Chroma: 2 to 4 dry, 2 or 3 moist

Texture: sandy loam

Clay: 12 to 17 percent

Rock fragments: 20 to 65 percent gravels and cobbles

Reaction: slightly alkaline to moderately alkaline

C horizon

Hue: 7.5YR

Value: 4 to 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

Texture: fine sandy loam, sandy loam

Clay: 10 to 17 percent

Rock fragments: 35 to 70 percent gravels, cobbles, and stones

Reaction: moderately alkaline

60—Tassi gravelly loamy very fine sand, 0 to 3 percent slopes

Map Unit Setting

Landform(s): plateaus

Elevation: 5,840 to 6,060 feet (1,780 to 1,847 meters)

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)

Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau - Sagebrush - Grasslands

Map Unit Composition

Tassi and similar soils: 95 percent

Minor Components: 5 percent

-Soils greater than 10 inches deep with an argillic and/or calcic horizon

Soil Properties and Qualities

Tassi soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic, shallow Ustic Petrocalcids

Geomorphic position: occurs on summits of plateaus

Parent material: sandy alluvium and/or sandy colluvium derived from calcareous 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: 10 percent

-bare soil: 70 percent

rock fragments: 0 percent

Depth to restrictive feature(s): 14 to 20 inches to petrocalcic

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 0.06 inches per hour (0.01 to 0.42 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: negligible

Hydrologic group: D

Ecological site name: Shallow Loamy 10-14" p.z.

Ecological site number: R035XC319AZ

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Present vegetation: Wyoming big sagebrush, blue grama, bottlebrush squirreltail, galleta, Hesperostipa, winterfat, Douglas rabbitbrush
Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 36° 17' 10.00" north, 111° 48' 20.00" west

AB—0 to 2 inches (0 to 5 cm); strong brown (7.5YR 4/6) gravelly loamy very fine sand, dark brown (7.5YR 3/4), moist; 4 percent clay; weak fine granular structure; loose, nonsticky, nonplastic; common very fine roots; 20 percent gravel; slightly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; abrupt smooth boundary.

Bk1—2 to 10 inches (5 to 25 cm); strong brown (7.5YR 4/6) gravelly very fine sandy loam, dark brown (7.5YR 3/4), moist; 5 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine and few fine roots; common very fine interstitial pores; few carbonate, finely disseminated; 15 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk2—10 to 19 inches (25 to 48 cm); strong brown (7.5YR 4/6) extremely cobbly very fine sandy loam, dark brown (7.5YR 3/4), moist; 7 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and few fine roots; many very fine interstitial and few fine tubular pores; few fine carbonate, finely disseminated; 25 percent gravel, 30 percent cobble, and 25 percent flagstone; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Bkkm—19 inches (48 cm); common strongly cemented carbonate concretions in matrix; cemented by calcium carbonate material, petrocalcic.

Range in Characteristics

Tassi, as used in this survey, is a taxadjunct to the series because it has a loamy-skeletal particle size class, and does not have a lithic contact under the petrocalcic horizon. Tassi is a Loamy, mixed, superactive, mesic, shallow Ustic Petrocalcids.

Rock fragments of the control section: 70 to 85 percent gravels, cobbles, and flagstones

Particle-size control section clay content: 7 to 10 percent

AB horizon

Hue: 7.5YR
Value: 3 or 4, dry or moist
Chroma: 4 or 6, dry or moist
Texture: loamy very fine sand
Clay: 3 to 7 percent
Calcium carbonate equivalent: 0 to 2 percent
Rock fragments: 15 to 30 percent gravels
Reaction: moderately alkaline

Bk horizon

Hue: 7.5YR
Value: 3 or 4, dry or moist
Chroma: 4 or 6, dry or moist
Texture: very fine sandy loam
Clay: 3 to 10 percent

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Calcium carbonate equivalent: 0 to 4 percent
Rock fragments: 15 to 85 percent gravels, cobbles, and flagstones
Reaction: moderately alkaline

Bkkm horizon

Cementation kind: calcium carbonate
Cementation strength: indurated
Thickness: 10 inches (25 cm)

Petrocalcic horizon: the zone from 19 to 29 inches (48 to 73 cm), (Bkkm horizon)

61—Tours fine sandy loam, 0 to 8 percent slopes

Map Unit Setting

Landform(s): alluvial fans, flood plains
Elevation: 4,400 to 5,900 feet (1,341 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 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Tours and similar soils: 80 percent
Minor Components: 20 percent
-Ives and similar soils
-Navajo and similar soils
-Epikom and similar soils

Soil Properties and Qualities

Tours soils

Taxonomic classification: Fine-silty, mixed, superactive, calcareous, mesic Typic
Torrifluvents
Geomorphic position: occurs on alluvial fans and flood plains
Parent material: mixed alluvium
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: 50 percent
-woody debris: 10 percent
-bare soil: 40 percent
rock fragments: 0 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: 10.6 (very high)
Shrink-swell potential: about 4.5 LEP (moderate)

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Flooding hazard: rare

Runoff class: medium

Hydrologic group: C

Ecological site name: Clayey Wash 6-10" p.z.

Ecological site number: R035XB202AZ

Present vegetation: alkali sacaton, fourwing saltbush, western wheatgrass, blue grama, galleta, vine mesquite, Indian ricegrass, sideoats grama

Land capability (non irrigated): 7c

Typical Profile

Typical pedon is from the Soil Survey of Coconino County Area, Arizona, Central Part.

Location

Geographic Coordinate System: 35° 4' 56.36" north, 110° 42' 45.66" west

A—0 to 2 inches (0 to 5 cm); light reddish brown (2.5YR 6/4) fine sandy loam, reddish brown (2.5YR 4/4), moist; 15 percent clay; moderate fine platy structure; hard, firm, moderately sticky, moderately plastic; few medium roots; many very fine vesicular pores; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

C1—2 to 10 inches (5 to 25 cm); reddish brown (2.5YR 5/4) sandy clay loam, reddish brown (2.5YR 4/4), moist; 30 percent clay; weak thick platy parts to weak fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine roots; many very fine vesicular pores; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C2—10 to 24 inches (25 to 61 cm); reddish brown (2.5YR 5/4) silty clay loam, dark reddish brown (2.5YR 3/4), moist; 30 percent clay; moderate fine platy structure; hard, firm, moderately sticky, moderately plastic; common medium and fine roots; few fine tubular pores; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

C3—24 to 39 inches (61 to 99 cm); reddish brown (2.5YR 5/4) silt loam, dark red (2.5YR 3/6), moist; 25 percent clay; weak fine platy structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; few fine tubular pores; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

C4—39 to 46 inches (99 to 117 cm); reddish brown (2.5YR 5/4) very fine sandy loam, dark red (2.5YR 3/6), moist; 18 percent clay; weak coarse platy parts to weak fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine roots; common fine tubular pores; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C5—46 to 60 inches (117 to 152 cm); reddish brown (2.5YR 5/4) silty clay loam, dark reddish brown (2.5YR 3/4), moist; 30 percent clay; moderate fine platy structure; hard, firm, moderately sticky, moderately plastic; few very fine roots; common fine tubular pores; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

Range in Characteristics

Rock fragments of the control section: 0 to 5 percent gravels

Particle-size control section clay content: 22 to 31 percent

A horizon

Hue: 2.5YR

Value: 6 dry, 4 moist

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Chroma: 4, dry or moist
Texture: fine sandy loam
Clay: 12 to 18 percent
Calcium carbonate equivalent: 0 to 4 percent
Rock fragments: 0 to 5 percent gravels
Reaction: moderately alkaline

C horizon

Hue: 2.5YR
Value: 5 dry, 3 or 4 moist
Chroma: 4 or 6, dry or moist
Texture: sandy clay loam, silty clay loam, silt loam, very fine sandy loam
Clay: 15 to 35 percent
Calcium carbonate equivalent: 0 to 10 percent
Rock fragments: 0 to 5 percent gravels
Reaction: moderately alkaline

62—Tuba-Tyende family-Fajada family complex, 2 to 15 percent slopes

Map Unit Setting

Landform(s): dunes, plateaus, sand sheets
Elevation: 5,040 to 5,250 feet (1,535 to 1,600 meters)
Mean annual precipitation: 6 to 10 inches (152 to 254 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days
Major Land Resource Area: 35 - Colorado Plateau
Land Resource Unit: 35-2 Colorado Plateau Shrub - Grasslands

Map Unit Composition

Tuba and similar soils: 45 percent
Tyende family and similar soils: 30 percent
Fajada family and similar soils: 15 percent
Minor Components: 10 percent
-Sandy Typic Torriorthents
-Fine Loamy Typic Haplocalcids

Soil Properties and Qualities

Tuba soils

Taxonomic classification: Mixed, mesic Typic Torripsamments
Geomorphic position: occurs on dune footslopes, toeslopes, and interdunes
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

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Physical cover

- canopy plant cover: 30 percent
- woody debris: 10 percent
- bare soil: 60 percent
- rock fragments: 0 percent

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: 6.9 (moderate)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: very low

Hydrologic group: A

Ecological site name: Sandy Upland 6-10" p.z. Sodic

Ecological site number: R035XB223AZ

Present vegetation: mound saltbush, black greasewood, Torrey seepweed

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 9' 22.94" north, 111° 13' 44.34" west

Cn1—0 to 4 inches (0 to 10 cm); reddish yellow (7.5YR 6/6) sand, strong brown (7.5YR 4/6), moist; 2 percent clay; weak medium platy parts to single grain structure; soft, loose, nonsticky, nonplastic; common very fine and few fine roots; many fine interstitial pores; strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.5; clear smooth boundary.

Cn2—4 to 17 inches (10 to 43 cm); reddish yellow (7.5YR 6/6) loamy sand, strong brown (7.5YR 4/6), moist; 3 percent clay; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and few fine roots; many fine interstitial pores; slightly effervescent, 1 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

Cn3—17 to 42 inches (43 to 107 cm); reddish yellow (7.5YR 6/6) loamy fine sand, strong brown (7.5YR 4/6), moist; 4 percent clay; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common very fine and few fine roots; few very fine tubular pores; strongly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 9.0; abrupt smooth boundary.

2Bt_{nb}1—42 to 55 inches (107 to 140 cm); yellowish red (5YR 4/6) sandy clay loam, dark reddish brown (5YR 3/4), moist; 29 percent clay; moderate coarse prismatic structure; hard, firm, slightly sticky, moderately plastic; common very fine and few fine roots; common very fine and few fine tubular pores; very few clay bridges between sand grains and very few clay films on surfaces along pores; violently effervescent, 5 percent calcium carbonate equivalent; very strongly alkaline, pH 9.6; gradual smooth boundary.

2Bt_{nb}2—55 to 65 inches (140 to 165 cm); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4), moist; 14 percent clay; moderate coarse prismatic structure; hard, friable, slightly sticky, slightly plastic; few very fine and fine tubular pores; very few clay bridges between sand grains and very few clay films on surfaces along pores; strongly effervescent, 2 percent calcium carbonate equivalent; very strongly alkaline, pH 9.6.

Range in Characteristics

Particle-size control section clay content: 1 to 10 percent

C, Cn horizons

Hue: 7.5YR, 5YR

Value: 4 or 6, dry or moist

Chroma: 6, dry or moist

Texture: sand, loamy sand, loamy fine sand

Clay: 1 to 10 percent

Calcium carbonate equivalent: 0 to 4 percent

SAR: 0 to 12

Reaction: strongly alkaline

2Bt_{nb} horizon

Hue: 7.5YR, 5YR

Value: 3 to 5, dry or moist

Chroma: 4 to 6, dry or moist

Texture: sandy clay loam, fine sandy loam

Clay: 10 to 35 percent

Calcium carbonate equivalent: 0 to 10 percent

SAR: 13 to 20

Reaction: strongly alkaline to very strongly alkaline

Some pedons do not have the buried 2B_{tn} horizons.

Tyende family soils

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Natrargids

Geomorphic position: occurs on all hillslope positions on eroded dunes

Parent material: alluvium and/or 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: 30 percent

-woody debris: 10 percent

-bare soil: 60 percent

rock fragments: 0 percent

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: 5.9 (moderate)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: low

Hydrologic group: B

Ecological site name: Sandy Upland 6-10" p.z. Sodic

Ecological site number: R035XB223AZ

Present vegetation: alkali sacaton, black greasewood, rubber rabbitbrush, shadscale saltbush, fourwing saltbush

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 8' 42.40" north, 111° 16' 24.70" west

C—0 to 5 inches (0 to 13 cm); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 5/6), moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; few medium and very fine roots; common very fine and few fine tubular pores; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

BCn—5 to 13 inches (13 to 33 cm); yellowish red (5YR 5/6) loamy fine sand, reddish yellow (5YR 6/6), moist; 4 percent clay; weak coarse prismatic structure; slightly hard, friable, nonsticky, nonplastic; few medium and very fine roots; few medium, common very fine, and few fine tubular pores; strongly effervescent, 12 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

2Btn—13 to 19 inches (33 to 48 cm); yellowish red (5YR 4/6) fine sandy loam, yellowish red (5YR 5/6), moist; 11 percent clay; strong coarse columnar structure; very hard, firm, slightly sticky, slightly plastic; few medium and very fine roots; many very fine tubular pores; very few clay bridges between sand grains and very few clay films on surfaces along pores; strongly effervescent, 12 percent calcium carbonate equivalent; very strongly alkaline, pH 9.6; clear smooth boundary.

2Btkny—19 to 25 inches (48 to 64 cm); yellowish red (5YR 4/6) sandy clay loam, yellowish red (5YR 5/6), moist; 28 percent clay; strong coarse prismatic structure; extremely hard, firm, moderately sticky, moderately plastic; few very fine roots; many very fine vesicular pores; very few clay bridges between sand grains and very few clay films on surfaces along pores; common gypsum masses in matrix and many carbonate masses in matrix; violently effervescent, 20 percent calcium carbonate equivalent and 2 percent gypsum; very strongly alkaline, pH 9.6; clear smooth boundary.

2Btkn—25 to 35 inches (64 to 89 cm); yellowish red (5YR 5/8) fine sandy loam, yellowish red (5YR 5/8), moist; 7 percent clay; weak coarse prismatic parts to weak coarse subangular blocky structure; moderately hard, friable, slightly sticky, nonplastic; few very fine roots; few very fine tubular pores; very few clay films on surfaces along pores; few carbonate masses in matrix; strongly effervescent, 12 percent calcium carbonate equivalent; very strongly alkaline, pH 9.2; clear smooth boundary.

2Bk—35 to 50 inches (89 to 127 cm); yellowish red (5YR 5/8) loamy fine sand, yellowish red (5YR 5/8), moist; 4 percent clay; weak coarse subangular blocky structure; soft, loose, nonsticky, nonplastic; few very fine roots; few very fine tubular pores; few carbonate masses in matrix; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; gradual smooth boundary.

2Ck—50 to 60 inches (127 to 152 cm); yellowish red (5YR 5/6) fine sand, reddish yellow (5YR 6/6), moist; 2 percent clay; single grain; soft, very friable, nonsticky, nonplastic; few fine roots; few very fine tubular pores; few common carbonate masses in matrix; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

Range in Characteristics

Tyende family differs from the series because it is very deep and has SAR that ranges below 30 and gypsum that ranges up to 4 percent

Particle-size control section clay content: 3 to 15 percent

C, BCn horizons
Hue: 5YR

Soil Survey of Little Colorado River Area, Arizona

Value: 5 or 6, dry or moist
Chroma: 6, dry or moist
Texture: fine sand, loamy fine sand
Clay: 0 to 5 percent
Calcium carbonate equivalent: 0 to 4 percent
SAR: 0 to 4
Reaction: moderately alkaline to strongly alkaline

2B_{tn} horizon

Hue: 5YR
Value: 4 to 6, dry or moist
Chroma: 6, dry or moist
Texture: fine sandy loam
Clay: 8 to 18 percent
Calcium carbonate equivalent: 0 to 2 percent
SAR: 13 to 20
Reaction: very strongly alkaline

2B_{t_{kn}} horizon

Hue: 5YR
Value: 4 or 5, dry or moist
Chroma: 6 or 8, dry or moist
Texture: sandy clay loam, fine sandy loam
Clay: 5 to 35 percent
Calcium carbonate equivalent: 5 to 25 percent
Gypsum: 0 to 4 percent
SAR: 13 to 20
EC: 4 to 8
Reaction: very strongly alkaline

2B_k, 2C horizons

Hue: 5YR
Value: 5 or 6, dry or moist
Chroma: 6 or 8, dry or moist
Texture: loamy fine sand, fine sand
Clay: 1 to 5 percent
Calcium carbonate equivalent: 0 to 4 percent
EC: 2 to 4
Reaction: moderately alkaline to strongly alkaline

Natric horizon: the zone from 13 to 35 inches (33 to 89 cm), (B_{tn}, 2B_{t_{kn}}1, 2B_{t_{kn}}2 horizons)

Calcic horizon: the zone from 19 to 50 inches (48 to 127 cm), (2B_{t_{kn}}1, 2B_{t_{kn}}2, 2B_k horizons)

Fajada family soils

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Typic Natrargids

Geomorphic position: occurs on eroded interdunes and slick areas

Parent material: eolian sands over alluvium derived from sandstone

Slope: 2 to 8 percent

Surface cover:

- Biological crust
 - cyanobacteria: 0 percent
 - lichen: 0 percent
 - moss: 0 percent

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Chemical crust

-salt: 0 percent

-gypsum: 0 percent

Physical cover

-canopy plant cover: 30 percent

-woody debris: 10 percent

-bare soil: 60 percent

rock fragments: 0 percent

Depth to restrictive feature(s): 39 to 60 inches to bedrock, paralithic

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 (0.01 to 1.40 micrometers per second)

Available water capacity total inches: 4.7 (low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: occasional

Runoff class: low

Hydrologic group: B

Ecological site name: Sandy Upland 6-10" p.z. Sodic

Ecological site number: R035XB223AZ

Present vegetation: black grama, blue grama, bottlebrush squirreltail, galleta, Indian ricegrass, needle and thread, sand dropseed

Land capability (non irrigated): 7c

Typical Profile

Location

Geographic Coordinate System: 36° 9' 0.40" north, 111° 13' 22.20" west

Btn—0 to 3 inches (0 to 8 cm); reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 4/6), moist; 28 percent clay; weak coarse prismatic structure; slightly hard, friable, nonsticky, nonplastic; common very fine roots; common very fine and fine irregular pores; very few pressure faces and very few clay films on surfaces along pores; slightly effervescent, 2 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear smooth boundary.

Btkn1—3 to 13 inches (8 to 33 cm); reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 4/6), moist; 30 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; common very fine roots; common very fine and fine irregular pores; very few pressure faces and very few clay films on surfaces along pores; common carbonate masses in matrix; slightly effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear smooth boundary.

Btkn2—13 to 29 inches (33 to 74 cm); reddish yellow (7.5YR 6/6) fine sandy loam, strong brown (7.5YR 4/6), moist; 18 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; few very fine roots; common very fine and few fine irregular pores; very few pressure faces and very few clay films on surfaces along pores; common carbonate masses in matrix; slightly effervescent, 10 percent calcium carbonate equivalent; strongly alkaline, pH 8.8; clear smooth boundary.

Bkn—29 to 40 inches (74 to 102 cm); strong brown (7.5YR 5/6) fine sandy loam, strong brown (7.5YR 4/6), moist; 15 percent clay; massive; hard, firm, slightly sticky, slightly plastic; few very fine roots; few medium, common very fine and common fine irregular pores; few carbonate masses in matrix; violently effervescent, 2 percent calcium carbonate equivalent; very strongly alkaline, pH 9.6; clear smooth boundary.

CR—40 inches (102 cm); fractured, weathered sandstone bedrock

Range in Characteristics

Fajada family differs from the series because it is deep to a paralithic contact, lacks an E surface horizon, and has hues of 5YR to 7.5YR.

Particle-size control section clay content: 16 to 30 percent

Btn horizon

Hue: 5YR, 7.5YR
Value: 4 to 6, dry or moist
Chroma: 6, dry or moist
Texture: sandy clay loam
Clay: 20 to 35 percent
Calcium carbonate equivalent: 0 to 4 percent
SAR: 0 to 4
Reaction: strongly alkaline

Btkn horizon

Hue: 5YR, 7.5YR
Value: 4 to 6, dry or moist
Chroma: 6, dry or moist
Texture: sandy clay loam, fine sandy loam
Clay: 10 to 35 percent
Calcium carbonate equivalent: 5 to 15 percent
SAR: 0 to 4
Reaction: strongly alkaline

Bkn horizon

Hue: 5YR, 7.5YR
Value: 4 or 5, dry or moist
Chroma: 6, dry or moist
Texture: fine sandy loam
Clay: 7 to 20 percent
Calcium carbonate equivalent: 0 to 4 percent
SAR: 5 to 12
Reaction: very strongly alkaline

Natric horizon: the zone from 0 to 29 inches (0 to 74 cm), (Btn, Btkn1, Btkn2 horizons)

63—Tuweep very gravelly loam, 0 to 15 percent slopes

Map Unit Setting

Landform(s): plateaus

Elevation: 5,400 to 6,400 feet (1,646 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 12.0 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: 35-3 Colorado Plateau Sagebrush - Grasslands

Map Unit Composition

Tuweep and similar soils: 80 percent

Minor Components: 20 percent

-Loamy Lithic Haplustolls and similar soils

-Cross and similar soils

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- Wupatki and similar soils
- Aut and similar soils

Soil Properties and Qualities

Tuweep soils

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Calcic Argids

Geomorphic position: occurs on summit of basalt plateaus

Parent material: alluvium derived from basalt and/or pyroclastic rock

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: 40 percent

-woody debris: 0 percent

-bare soil: 60 percent

rock fragments: 0 percent

Drainage class: well drained

Ksat solum: 0.20 to 2.00 inches per hour (1.40 to 14.10 micrometers per second)

Available water capacity total inches: 7.9 (high)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: high

Hydrologic group: C

Ecological site name: Loamy Upland 10-14" p.z.

Ecological site number: R035XA113AZ

Present vegetation: black grama, blue grama, bottlebrush squirreltail, Indian ricegrass, galleta, winterfat, fourwing saltbush

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Coconino County Area, Arizona, Central Part.

Location

Geographic Coordinate System: 35° 39' 52.50" north, 111° 31' 38.72" west

A—0 to 3 inches (0 to 8 cm); pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3), moist; 20 percent clay; moderate thick platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine and medium roots; many very fine and fine vesicular pores; 55 percent gravel; slightly effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.5; clear smooth boundary.

Bt—3 to 9 inches (8 to 23 cm); pale brown (10YR 6/3) loam, dark brown (10YR 3/3), moist; 25 percent clay; moderate fine subangular blocky structure; hard, very friable, slightly sticky, slightly plastic; common fine and medium roots; common fine interstitial and tubular pores; few clay films on surfaces along pores; 10 percent gravel; slightly effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; clear wavy boundary.

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Btk—9 to 16 inches (23 to 41 cm); light yellowish brown (10YR 6/4) clay loam, brown (7.5YR 5/4), moist; 30 percent clay; moderate very fine and fine subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common fine and medium roots; common fine interstitial and tubular pores; few clay films on surfaces along pores; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; clear wavy boundary.

Bk1—16 to 34 inches (41 to 86 cm); very pale brown (10YR 8/3) clay loam, light brown (7.5YR 6/4), moist; 30 percent clay; massive; slightly hard, very friable, slightly sticky, nonplastic; common fine and medium roots; few very fine and fine tubular pores; common carbonate masses in matrix; violently effervescent, 45 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt irregular boundary.

2Bk2—34 to 60 inches (86 to 152 cm); light yellowish brown (10YR 6/4) extremely stony loam, brown (7.5YR 5/4), moist; 18 percent clay; massive; soft, very friable, moderately sticky, moderately plastic; few fine and medium roots; few fine interstitial pores; many carbonate masses in matrix; 70 percent stone; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

Range in Characteristics

Rock fragments of the control section: 2 to 5 percent gravels

Particle-size control section clay content: 27 to 34 percent

A horizon

Hue: 10YR, 7.5YR

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 3, dry or moist

Texture: loam

Clay: 18 to 25 percent

Calcium carbonate equivalent: 0 to 4 percent

Rock fragments: 40 to 55 percent gravels

Reaction: slightly alkaline to moderately alkaline

Bt, Btk horizon

Hue: 10YR, 7.5YR

Value: 5 or 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: loam, clay loam

Clay: 25 to 34 percent

Calcium carbonate equivalent: 0 to 10 percent

Rock fragments: 0 to 12 percent gravels

Reaction: slightly alkaline to moderately alkaline

Bk horizon

Hue: 10YR, 7.5YR

Value: 6 or 8 dry, 5 or 6 moist

Chroma: 3 or 4, dry or moist

Texture: clay loam, loam

Clay: 15 to 34 percent

Calcium carbonate equivalent: 15 to 50 percent

Rock fragments: 0 to 80 percent stones

Reaction: moderately alkaline

Argillic horizon: the zone from 3 to 16 inches (8 to 41 cm), (Bt, Btk horizons)

Calcic horizon: the zone from 16 to 60 inches (41 to 153 cm), (Bk, 2Bk horizons)

64—Water

Streams, lakes, and ponds. 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.

65—Wilaha gravelly loam, cindery, 2 to 30 percent slopes

Map Unit Setting

Landform(s): fan terraces, hills

Elevation: 5,800 to 6,330 feet (1,768 to 1,929 meters)

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)

Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-6 Colorado Plateau Pinyon - Juniper - Sagebrush

Map Unit Composition

Wilaha and similar soils: 80 percent

Minor Components: 20 percent

-Clayey over fragmental Aridic Argiustolls

-Wukoki and similar soils

-Aut and similar soils

-Cross and similar soils

-Rock outcrop

Soil Properties and Qualities

Wilaha soils

Taxonomic classification: Fine-loamy over fragmental, mixed, superactive, mesic
Vitrandic Haplargids

Geomorphic position: occurs on fan terraces and hillsides

Parent material: alluvium derived from basalt and/or pyroclastic rock

Slope: 2 to 30 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

rock fragments: 0 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: 3.5 (low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: high

Soil Survey of Little Colorado River Area, Arizona

Hydrologic group: C

Ecological site name: Cinder Upland 14-18" p.z.

Ecological site number: R035XG704AZ

Present vegetation: blue grama, muttongrass, bottlebrush squirreltail, Fremont's mahonia, goldeneye, Mexican cliffrose, penstemon, skunkbush sumac, threeawn, wolfberry

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Coconino County Area, Arizona, Central Part.

Location

Geographic Coordinate System: 34° 48' 30.50" north, 110° 52' 55.71" west

A1—0 to 2 inches (0 to 5 cm); reddish brown (5YR 5/3) gravelly loam, dark reddish brown (5YR 3/3), moist; 22 percent clay; moderate very fine granular structure; soft, very friable, nonsticky, nonplastic; few fine roots; many very fine interstitial pores; 20 percent cinders; noneffervescent; slightly alkaline, pH 7.5; abrupt smooth boundary.

A2—2 to 5 inches (5 to 13 cm); reddish brown (5YR 4/3) gravelly loam, dark reddish brown (5YR 3/3), moist; 22 percent clay; weak medium subangular blocky parts to weak fine granular structure; slightly hard, friable, slightly sticky, nonplastic; common fine roots; few very fine tubular and common very fine interstitial pores; 25 percent cinders; noneffervescent; slightly alkaline, pH 7.6; gradual wavy boundary.

Bt1—5 to 8 inches (13 to 20 cm); reddish brown (5YR 5/3) gravelly clay loam, dark reddish brown (5YR 3/3), moist; 30 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine roots; common fine tubular pores; very few clay films on surfaces along pores; 25 percent cinders; noneffervescent; slightly alkaline, pH 7.6; gradual wavy boundary.

Bt2—8 to 14 inches (20 to 36 cm); reddish brown (5YR 5/4) gravelly clay loam, dark reddish brown (5YR 3/4), moist; 30 percent clay; weak medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; few fine tubular pores; very few clay films on all faces of peds; 25 percent cinders; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; gradual wavy boundary.

Bk—14 to 17 inches (36 to 43 cm); pinkish gray (7.5YR 7/2) very gravelly loam, brown (7.5YR 5/4), moist; 22 percent clay; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; common carbonate concretions on bottom of rock fragments; 45 percent cinders; strongly effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; abrupt wavy boundary.

2Ck—17 to 60 inches (43 to 152 cm) cinders; 1 percent clay; single grain; loose, nonsticky, nonplastic; few coarse roots; few carbonate masses in matrix and common carbonate concretions on bottom of rock fragments; 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

Range in Characteristics

Wilaha, as used in this survey, is a taxadjunct to the series because it has an ustic aridic moisture regime. Wilaha series is a Fine-loamy over fragmental, mixed, superactive, mesic Vitritorrandic Argiustolls.

Rock fragments of the control section: 13 to 30 percent cinders

Particle-size control section clay content: 28 to 35 percent

A horizon

Hue: 5YR or 7.5YR

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Value: 4 or 5 dry, 3 or 4 moist
Chroma: 2 or 3, dry or moist
Texture: loam
Clay: 20 to 25 percent
Calcium carbonate equivalent: 0 to 2 percent
Rock fragments: 15 to 30 percent cinders
Reaction: slightly alkaline to moderately alkaline

Bt horizon

Hue: 5YR or 7.5YR
Value: 3 to 5, dry or moist
Chroma: 3 or 4, dry or moist
Texture: clay loam
Clay: 28 to 35 percent
Calcium carbonate equivalent: 0 to 10 percent
Rock fragments: 10 to 30 percent cinders
Reaction: slightly alkaline to moderately alkaline

Bk horizon

Hue: 5YR or 7.5YR
Value: 5 or 7, dry or moist
Chroma: 2 to 4, dry or moist
Texture: loam
Clay: 20 to 25 percent
Calcium carbonate equivalent: 15 to 25 percent
Rock fragments: 35 to 55 percent cinders
Reaction: slightly alkaline to moderately alkaline

2Ck horizon

Texture: cinders
Clay: 0.5 to 2 percent
Calcium carbonate equivalent: 15 to 25 percent
Rock fragments: 92 to 97 percent cinders
Reaction: moderately alkaline

Argillic horizon: the zone from 5 to 14 inches (13 to 36 cm), (Bt horizon)

66—Winona-Tusayan association, 2 to 8 percent slopes

Map Unit Setting

Landform(s): plateaus

Elevation: 5,000 to 6,100 feet (1,524 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 to 12.0 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: 35-3 Colorado Plateau Sagebrush - Grasslands

Map Unit Composition

Winona and similar soils: 50 percent

Tusayan and similar soils: 40 percent

Minor Components: 10 percent

-Coarse-loamy Cumulic Haplustolls

-Fine-loamy Cumulic Haplustolls

Soil Properties and Qualities

Winona soils

Taxonomic classification: Loamy-skeletal, carbonatic, mesic Lithic Ustic Haplocalcids

Geomorphic position: occurs on summits and gentle side slopes of plateaus and hills

Parent material: colluvium over residuum weathered from limestone and sandstone

Slope: 2 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: 65 percent

-woody debris: 0 percent

-bare soil: 35 percent

rock fragments

gravel: 15 percent

channer: 2 percent

flagstone: 5 percent

Depth to restrictive feature(s): 6 to 20 inches to bedrock, lithic

Drainage class: well drained

Ksat solum: 0.57 to 1.98 inches per hour (4.00 to 14.00 micrometers per second)

Ksat restrictive layer: 0.00 to 0.06 inches per hour (0.00 to 0.42 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: low

Hydrologic group: D

Ecological site name: Shallow Loamy 10-14" p.z.

Ecological site number: R035XC319AZ

Present vegetation: black grama, blue grama, Bigelow sagebrush, needle and thread, sideoats grama, dropseed, *Ephedra*, fourwing saltbush, galleta, juniper, Mexican cliffrose, winterfat

Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 35° 11' 59.60" north, 111° 13' 43.10" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) gravelly loam, brown (7.5YR 4/4), moist; 15 percent clay; weak fine subangular blocky structure; soft, friable, slightly sticky, slightly plastic; common fine roots; many fine interstitial pores; 25 percent gravel and 5 percent cobble; strongly effervescent, 25 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bk1—2 to 12 inches (5 to 30 cm); yellowish brown (10YR 5/4) extremely cobbly loam, brown (7.5YR 4/4), moist; 20 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; many fine interstitial and common fine tubular pores; 25 percent gravel and 40 percent cobble;

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violently effervescent, 50 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt wavy boundary.

Bk2—12 to 15 inches (30 to 38 cm); light yellowish brown (10YR 6/4) extremely cobbly loam, dark yellowish brown (10YR 4/4), moist; 20 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots; many very fine interstitial and common fine tubular pores; 30 percent gravel and 45 percent cobble; violently effervescent, 50 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; abrupt wavy boundary.

R—15 inches (38 cm); unfractured, unweathered limestone bedrock.

Range in Characteristics

Rock fragments of the control section: 60 to 80 percent gravels and cobbles

Particle-size control section clay content: 15 to 25 percent

A horizon

Hue: 10YR, 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: loam

Clay: 10 to 20 percent

Calcium carbonate equivalent: 15 to 30 percent

Rock fragments: 20 to 40 percent gravels and cobbles

Reaction: moderately alkaline to strongly alkaline

Bk horizon

Hue: 10YR, 7.5YR

Value: 5 or 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: loam

Clay: 15 to 25 percent

Calcium carbonate equivalent: 40 to 60 percent

Rock fragments: 55 to 85 percent gravels and cobbles

Reaction: moderately alkaline to strongly alkaline

Calcic horizon: the zone from 2 to 15 inches (5 to 38 cm), (Bk horizon)

Tusayan soils

Taxonomic classification: Loamy-skeletal, carbonatic, mesic Ustic Haplocalcids

Geomorphic position: occurs on plateaus and mesas

Parent material: colluvium over residuum weathered from limestone and sandstone

Slope: 2 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: 65 percent

-woody debris: 0 percent

-bare soil: 35 percent

rock fragments: 0 percent

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Depth to restrictive feature(s): 20 to 40 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: 2.8 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Runoff class: low
Hydrologic group: C
Ecological site name: Limy Upland 10-14" p.z.
Ecological site number: R035XC311AZ
Present vegetation: black grama, blue grama, sideoats grama, needle and thread, New Mexico feathergrass, bottlebrush squirreltail, fourwing saltbush, galleta, Indian ricegrass, winterfat
Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System: 34° 56' 23.80" north, 111° 5' 34.02" west

A1—0 to 3 inches (0 to 8 cm); brown (7.5YR 5/4) gravelly sandy loam, brown (7.5YR 4/4), moist; 10 percent clay; weak very fine granular structure; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine tubular pores; 30 percent gravel; strongly effervescent, 25 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

A2—3 to 10 inches (8 to 25 cm); brown (10YR 5/3) gravelly loam, dark yellowish brown (10YR 3/4), moist; 15 percent clay; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; few very fine tubular pores; 20 percent gravel; strongly effervescent, 25 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk1—10 to 16 inches (25 to 41 cm); light brownish gray (10YR 6/2) gravelly loam, brown (7.5YR 4/4), moist; 15 percent clay; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; few very fine tubular pores; 30 percent gravel; strongly effervescent, 50 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk2—16 to 27 inches (41 to 69 cm); brown (10YR 5/3) extremely gravelly loam, brown (7.5YR 4/4), moist; 15 percent clay; weak very fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; few very fine tubular pores; 70 percent gravel; violently effervescent, 50 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

Ck—27 to 29 inches (69 to 74 cm); light brown (7.5YR 6/4) very gravelly loam; 15 percent clay; massive; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; few very fine tubular pores; violently effervescent, 50 percent calcium carbonate equivalent; strongly alkaline, pH 8.7; clear smooth boundary.

R—29 inches (74 cm); unfractured, unweathered limestone bedrock.

Range in Characteristics

Rock fragments of the control section: 50 to 60 percent gravels
Particle-size control section clay content: 10 to 20 percent

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A horizon

Hue: 7.5YR, 10YR
Value: 5 to 6, dry or moist
Chroma: 3 to 4, dry or moist
Texture: sandy loam, loam
Clay: 5 to 20 percent
Calcium carbonate equivalent: 10 to 25 percent
Rock fragments: 15 to 30 percent gravels
Reaction: moderately alkaline

Bk horizon

Hue: 7.5YR, 10YR
Value: 5 to 6, dry or moist
Chroma: 3 to 4, dry or moist
Texture: loam
Clay: 20 to 28 percent
Calcium carbonate equivalent: 30 to 50 percent
Rock fragments: 25 to 75 percent gravels
Reaction: moderately alkaline to strongly alkaline

Ck horizon

Hue: 7.5YR
Value: 5 to 6, dry or moist
Chroma: 4 to 6, dry or moist
Texture: loam
Clay: 10 to 20 percent
Calcium carbonate equivalent: 30 to 50 percent
Rock fragments: 50 to 60 percent gravels
Reaction: moderately alkaline to strongly alkaline

Calcic horizon: the zone from 10 to 27 inches (25 to 69 cm), (Bk horizon)

67—Wukoki-Rock outcrop complex, 5 to 25 percent slopes

Map Unit Setting

Landform(s): hills

Elevation: 4,800 to 6,000 feet (1,463 to 1,829 meters)

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)

Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau Sagebrush - Grasslands

Map Unit Composition

Wukoki and similar soils: 70 percent

Rock outcrop: 25 percent

Minor Components: 5 percent

-Ashy-skeletal over fragmental or cindery Vitrandic Haplocambids

-Cindery Argiduridic Durustolls

-Cindery shallow Argiduridic Durustolls

-Fine-loamy Ustic Calciargids

Soil Properties and Qualities

Wukoki soils

Taxonomic classification: Ashy-skeletal over fragmental or cindery, mixed, mesic
Vitrandic Haplocambids

Geomorphic position: occurs on hillsides

Parent material: colluvium derived from pyroclastic rock

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: 20 percent

-woody debris: 0 percent

-bare soil: 80 percent

rock fragments

cinder: 85 percent

Drainage class: somewhat excessively drained

Ksat solum: 0.57 to 1.98 inches per hour (4.00 to 14.00 micrometers per second)

Available water capacity total inches: 2.9 (low)

Shrink-swell potential: about 4.5 LEP (moderate)

Flooding hazard: none

Runoff class: medium

Hydrologic group: B

Ecological site name: Cinder Hills 10-14" p.z.

Ecological site number: R035XA102AZ

Present vegetation: black grama, blue grama, dropseed, galleta, needlegrass, sideoats
grama, bottlebrush squirreltail, fourwing saltbush, winterfat

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Coconino County Area, Arizona, Central Part.

Location

Geographic Coordinate System: 35° 35' 56.22" north, 111° 36' 3.88" west

A1—0 to 2 inches (0 to 5 cm); brown (10YR 5/3) very gravelly loam, dark brown (7.5YR 3/2), moist; 20 percent clay; weak thick platy structure; slightly hard, very friable, slightly sticky, slightly plastic; few fine roots; few very fine and fine vesicular pores; 55 percent cinder; noneffervescent; slightly alkaline, pH 7.7; clear smooth boundary.

A2—2 to 10 inches (5 to 25 cm); brown (10YR 5/3) very gravelly loam, dark brown (7.5YR 3/2), moist; 20 percent clay; weak fine subangular blocky and weak fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine interstitial and few very fine and fine tubular pores; 40 percent cinder; noneffervescent; slightly alkaline, pH 7.8; clear wavy boundary.

Bw1—10 to 15 inches (25 to 38 cm); pale brown (10YR 6/3) very gravelly loam, dark yellowish brown (10YR 3/4), moist; 20 percent clay; weak very fine granular structure;

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slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine interstitial and few very fine and fine tubular pores; 50 percent cinder; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear wavy boundary.

Bw2—15 to 18 inches (38 to 46 cm); light yellowish brown (10YR 6/4) very gravelly loam, dark yellowish brown (10YR 3/4), moist; 20 percent clay; weak very fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; common very fine interstitial pores; 55 percent cinder; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear wavy boundary.

2Ck—18 to 65 inches (46 to 165 cm); dark gray (10YR 4/1) cinders, black (10YR 2/1), moist; 1 percent clay; single grain; loose, nonsticky, nonplastic; common carbonate concretions on bottom of rock fragments; 94 percent cinder; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

Range in Characteristics

Rock fragments of the control section: 76 to 88 percent cinders

Particle-size control section clay content: 5 to 8 percent

A horizon

Hue: 10YR, 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 to 4, dry or moist

Texture: loam

Clay: 18 to 25 percent

Calcium carbonate equivalent: 0 to 2 percent

Rock fragments: 35 to 59 percent cinders

Reaction: slightly alkaline to moderately alkaline

Bw horizon

Hue: 10YR, 7.5YR

Value: 3 to 6, dry or moist

Chroma: 3 or 4, dry or moist

Texture: loam

Clay: 18 to 25 percent

Calcium carbonate equivalent: 0 to 10 percent

Rock fragments: 35 to 85 percent cinders

Reaction: moderately alkaline

2Ck horizon

Hue: 10YR, 7.5YR

Value: 3 to 4 dry, 2 or 3 moist

Chroma: 1 or 2, dry or moist

Texture: cinders

Clay: 1 to 2 percent

Calcium carbonate equivalent: 15 to 25 percent

Rock fragments: 87 to 99 percent cinders

Reaction: moderately alkaline

Cambic horizon: the zone from 10 to 18 inches (25 to 46 cm), (Bw horizon)

Rock outcrop

Slope: 5 to 25 percent

Exposures of steep bedrock and cliffs, which are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

68—Wupatki-Wukoki complex, 0 to 15 percent slopes

Map Unit Setting

Landform(s): fan terraces, cinder cones

Elevation: 4,800 to 5,800 feet (1,463 to 1,768 meters)

Mean annual precipitation: 10 to 14 inches (254 to 356 millimeters)

Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 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: 35-3 Colorado Plateau Sagebrush – Grasslands

Map Unit Composition

Wupatki and similar soils: 60 percent

Wukoki and similar soils: 25 percent

Minor Components: 15 percent

-Rock outcrop

-Wukoki similar soils greater than 20 inches deep to cinders.

-Wupatki similar soils greater than 20 inches deep to duripan.

Soil Properties and Qualities

Wupatki soils

Taxonomic classification: Cindery, mixed, mesic, shallow Vitrandic Haplodurids

Geomorphic position: occurs on fan terraces at the footslopes of cinder cones

Parent material: cindery alluvium

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: 15 percent

-woody debris: 5 percent

-bare soil: 80 percent

rock fragments

cinder: 50 percent

Depth to restrictive feature(s): 8 to 20 inches to duripan

Drainage class: well drained

Ksat solum: 0.60 to 2.00 inches per hour (4.20 to 14.10 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: low

Hydrologic group: D

Ecological site name: Cinder Hills 10-14" p.z.

Soil Survey of Little Colorado River Area, Arizona

Ecological site number: R035XA102AZ

Present vegetation: black grama, galleta, *Sphaeralcea*, broom snakeweed, fourwing saltbush

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Coconino County Area, Arizona, Central Part.

Location

Geographic Coordinate System: 35° 34' 6.62" north, 111° 35' 0.61" west

A—0 to 6 inches (0 to 15 cm); grayish brown (10YR 5/2) very gravelly loam, dark brown (7.5YR 3/2), moist; 21 percent clay; weak very fine and fine subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine and fine roots; common very fine and fine tubular pores; many carbonate concretions on bottom of rock fragments; 48 percent cinder; slightly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; clear smooth boundary.

Bk—6 to 16 inches (15 to 41 cm); grayish brown (10YR 5/2) very gravelly loam, dark brown (10YR 3/3), moist; 21 percent clay; weak fine and medium granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; many carbonate concretions on bottom of rock fragments; 55 percent cinder; strongly effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; abrupt smooth boundary.

2Bkqm—16 to 20 inches (41 to 51 cm) cemented duripan; massive with thin laminar surface and carbonate pendants on lower surface; clear smooth boundary.

2C—20 to 60 inches (51 to 152 cm); very dark gray (N 3/0) cinders, black (10YR 2/1), moist; 1 percent clay; single grain; loose, nonsticky, nonplastic; 96 percent cinder; strongly effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 7.9.

Range in Characteristics

Wupatki, as used in this survey, is a taxadjunct to the series because it has an ustic aridic moisture regime. Wupatki series is a Cindery, mixed, mesic, shallow Argiduridic Durustolls.

Rock fragments of the control section: 39 to 57 percent cinders

Particle-size control section clay content: 18 to 25 percent

A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 to 5 moist

Chroma: 2 or 3, dry or moist

Texture: loam, fine sandy loam

Clay: 18 to 25 percent

Calcium carbonate equivalent: 1 to 5 percent

Rock fragments: 39 to 57 percent cinders

Reaction: slightly alkaline to moderately alkaline

Bk horizon

Hue: 7.5YR, 10YR

Value: 3 to 6, dry or moist

Chroma: 2 to 4, dry or moist

Texture: loam

Clay: 18 to 25 percent

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Calcium carbonate equivalent: 15 to 25 percent
Rock fragments: 39 to 57 percent cinders
Reaction: slightly alkaline to moderately alkaline

2Bkqm horizon

Cementation: indurated
Calcium carbonate equivalent: 15 to 30 percent
Thickness: 16 to 20 inches (41 to 51 cm)
Cemented by: silica and calcium carbonate

2C horizon

Hue: 10YR, N
Value: 2 or 3, dry or moist
Chroma: 0 or 1, dry or moist
Texture: cinders
Clay: 0 to 1 percent
Calcium carbonate equivalent: 10 to 15 percent
SAR: 0 to 12
Rock fragments: 90 to 100 percent cinders
Reaction: slightly alkaline to moderately alkaline

Duripan: the zone from 16 to 20 inches (Bkqm horizon)

Wukoki soils

Taxonomic classification: Ashy-skeletal over fragmental or cindery, mixed, mesic
Vitrandic Haplocambids

Geomorphic position: occurs on fan terraces at the footslopes of cinder cones

Parent material: cindery alluvium

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: 15 percent

-woody debris: 5 percent

-bare soil: 80 percent

rock fragments: 0 percent

Drainage class: somewhat excessively drained

Ksat solum: 0.60 to 2.00 inches per hour (4.20 to 14.10 micrometers per second)

Available water capacity total inches: 2.9 (low)

Shrink-swell potential: about 1.5 LEP (low)

Flooding hazard: none

Runoff class: low

Hydrologic group: B

Ecological site name: Cinder Hills 10-14" p.z.

Ecological site number: R035XA102AZ

Present vegetation: galleta, fourwing saltbush, *Sphaeralcea*

Land capability (non irrigated): 6c

Typical Profile

Typical pedon is from the Soil Survey of Coconino County Area, Arizona, Central Part.

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Location

Geographic Coordinate System: 35° 35' 56.35" north, 111° 36' 2.88" west

A—0 to 10 inches (0 to 25 cm); brown (10YR 5/3) very gravelly loam, dark brown (7.5YR 3/2), moist; 21 percent clay; weak thick platy structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine and fine interstitial pores; 48 percent cinder; noneffervescent; slightly alkaline, pH 7.6; clear wavy boundary.

Bw—10 to 18 inches (25 to 46 cm); pale brown (10YR 6/3) very gravelly loam, dark yellowish brown (10YR 3/4), moist; 21 percent clay; weak very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; 48 percent cinder; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

2Ck—18 to 60 inches (46 to 152 cm); dark gray (10YR 4/1) cinders, black (10YR 2/1), moist; 1 percent clay; massive; loose, nonsticky, nonplastic; 96 percent cinder; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

Range in Characteristics

Rock fragments of the control section: 76 to 88 percent cinders

Particle-size control section clay content: 5 to 8 percent

A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 to 4, dry or moist

Texture: loam, fine sandy loam

Clay: 18 to 25 percent

Rock fragments: 39 to 57 percent cinders

Reaction: slightly alkaline

Bw horizon

Hue: 7.5YR, 10YR

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: loam, coarse sandy loam

Clay: 18 to 25 percent

Calcium carbonate equivalent: 2 to 10 percent

Rock fragments: 39 to 57 percent cinders

Reaction: moderately alkaline

2Ck horizon

Hue: 2.5YR to 10YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 or 2, dry or moist

Texture: cinders

Clay: 0 to 1 percent

Calcium carbonate equivalent: 2 to 10 percent

Rock fragments: 90 to 100 percent cinders

Reaction: moderately alkaline

Cambic horizon: the zone from 10 to 18 inches (Bw horizon)

Formation and Geology 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.

Formation

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 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.

Geology

The Little Colorado River Soil Survey Area rests on the southern end of the Colorado Plateau. The Colorado Plateau extends 130,000 square miles through Colorado, Utah, New Mexico, and Arizona (Wheeler, 1990). The Colorado Plateau remained intact during the formation of the neighboring Rocky Mountains and basin and range country, creating a very old, stable, and high elevation landscape. The

Soil Survey of Little Colorado River Area, Arizona

survey area within the Colorado Plateau was affected by extensive geologic faulting and lifting, volcanic activity, and erosion by wind and water. The Little Colorado River Soil Survey Area can be recognized by three major stratigraphic features: the Painted Desert, the Kaibito Plateau, and the Kaibab Limestone Formation (AZGS, 2011).

The first feature, the Painted Desert, represents terraces from Cameron south to the survey boundary along the Little Colorado River floodplain. These vast, arid areas are made up of inter-bedded sedimentary cherty limestone and soft shale (Cooley, 1969). The geological formations are dominated by the Chinle and Moenkopie, with smaller portions of the Kayenta, Moenave, and Wingate. The Chinle Formation consists of highly erosive rounded hills of soft gray to purple shale. These areas are high in naturally occurring salts, including gypsum and sodium, which limit use and management. The Moenkopie Formation consists of stable red sandstone with portions of exposed level to rounded bedrock.

The second feature, the Kaibito Plateau, extends from Tuba City north to Page, ending at Lake Powell. The Kaibito Plateau consists of the Navajo Sandstone Formation known for its cliff-forming escarpments, large, level rock outcrops, and extensive sand sheets or dune fields. Remnants of the Carmel Formation are also present on the mesa tops, which is characterized by its soft shale and fine-bedded sandstone. The Moenkopi Plateau is adjacent to the Kaibito Plateau, but is separated by the incision of Moenkopie Wash. The Moenkopie Plateau is also Navajo Sandstone Formation and adjoins the Hopi Indian Reservation on its east side. As the Kaibito Plateau extends north a combination of formations, including Navajo and Kayenta, creates the Echo Cliffs.

The third feature, the Kaibab Limestone Formation, borders Grand Canyon National Park and the San Francisco Volcanic Field. The Kaibab Limestone formation predominantly creates structural benches and basins characterized by gray to tan cherty limestone and fine-grained sandstone (AZGS, 2011). The formation creates bedrock benches with dissected grassland prairies. These prairies are of great local importance for use in management of productive grasslands. The monocline of Grey Mountain is an example of the active geologic faulting and lifting of the limestone formation. Portions of the Kaibab Limestone Formation surrounding the San Francisco Volcanic field are capped by lava flows and cinder cones of varying ages protruding through the limestone.

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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.

Alluvial fan. A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley, or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium. Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction 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.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Badland. A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover

overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology). A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane. A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

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 with high, precipitous walls in an area of high local relief.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material 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.

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.
- Climax plant community.** The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.
- Coarse textured soil.** Sand or loamy sand.
- Cobble (or cobblestone).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.
- Cobbly soil material.** Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.
- COLE (coefficient of linear extensibility).** See Linear extensibility.
- Colluvium.** Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.
- Complex, soil.** A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.
- 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."
- 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.
- 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 sheetwash 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.
- 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 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 landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have 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 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.
- Hard bedrock.** Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.
- Hard to reclaim** (in tables). Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.
- Hardpan.** A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.
- Head slope.** 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.

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.

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

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

Landslide. A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

- Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state.
- Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.
- 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.
- 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 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, are as follows:

Impermeable	less than 0.0015 inches
Very slow	0.0,015 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.

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, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*
 - B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*
 - C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.
2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
 - A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*
 - B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).
 3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix. See Redoximorphic features.

Relief. The 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.

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.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called 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.

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

Shale. Sedimentary rock 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 nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

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

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $\text{Ca}^{++} + \text{Mg}^{++}$. 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 containing stones in numbers that interfere with or prevent tillage.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus. 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 taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as

taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terrace (geomorphology). A step-like surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

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.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

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

Weathering. All physical 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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