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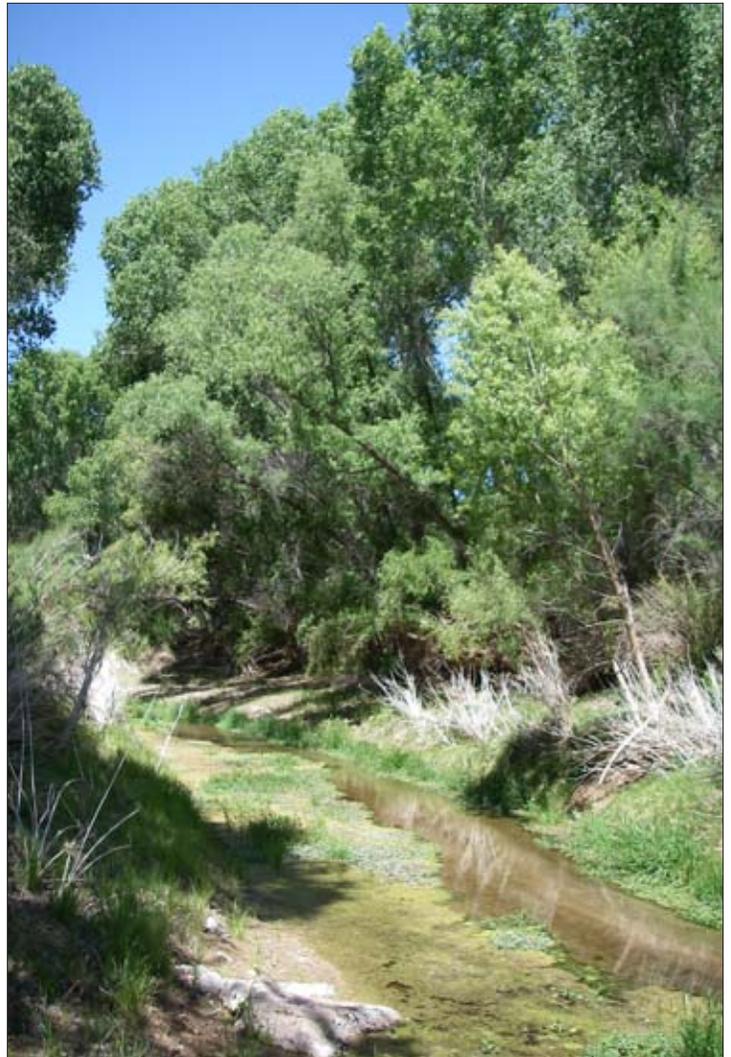


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In cooperation with  
Redington Natural  
Resource Conservation  
District, San Pedro Natural  
Resource Conservation  
District, Willcox-San Simon  
Natural Resource  
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Arizona Agricultural  
Experiment Station

# Soil Survey of Cochise County, Arizona, Northwestern Part



# How To Use This Soil Survey

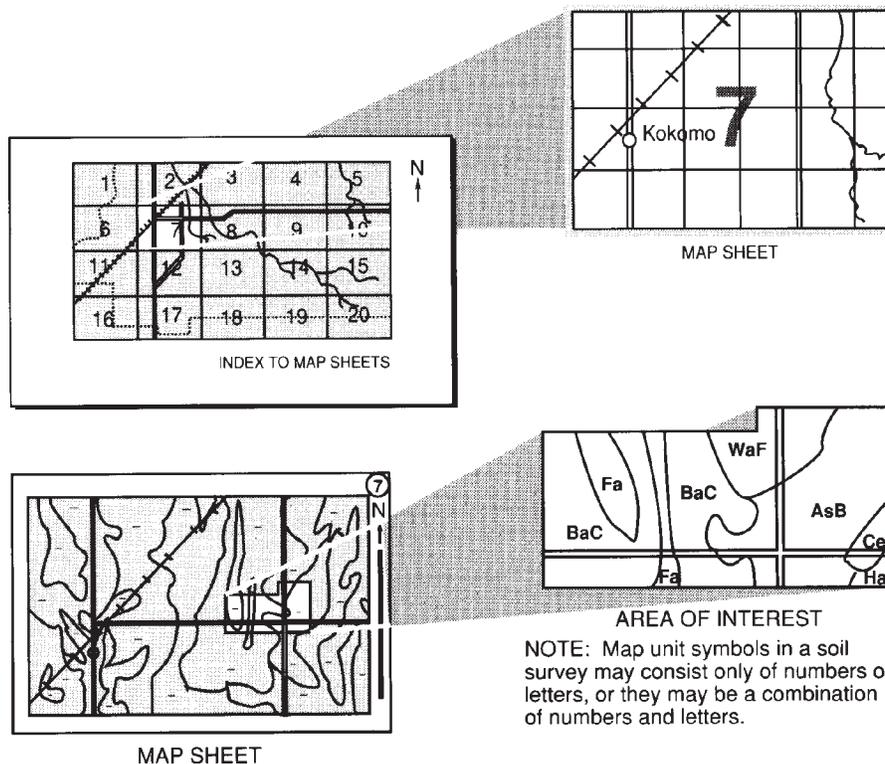
## Detailed Soil Maps

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

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

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

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



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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 March 2007. Soil names and descriptions were approved in April of 2007. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2007. This survey was made cooperatively by the Natural Resources Conservation Service; the Redington, San Pedro, and Willcox-San Simon Natural Resource Conservation Districts; United States Department of Interior-Bureau of Land Management and the Arizona Agricultural Experiment Station. The survey is part of the technical assistance furnished to the Agriculture Research Service; Bureau of Land Management; and the Redington, San Pedro, and Willcox-San Simon Natural Resource Conservation Districts.

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: Top left—Low rolling hills in the foreground are a typical area of the Kuykendall-Cherrycow-Rock outcrop complex, 5 to 60 percent slopes. Tall mountains in the background are Magoffin-Budlamp-Rock outcrop, 5 to 70 percent slopes.**

**Bottom left—Looking southeast of Dragoon, Arizona, toward the Dragoon Mountains. The foreground is a typical area of Budlamp-Woodcutter-Rock outcrop complex, 15 to 60 percent slopes. The valley between the Dragoon Mountains has many different map units. The yellowish brown areas are the Stronghold-McAllister-Elgin complex, 5 to 25 percent slopes, and Nolam-Stronghold complex, 5 to 30 percent slopes. The darker areas are Blakeney family-Luckyhills complex, 3 to 15 percent slopes. The Dragoon Mountains are in the background.**

**Right—Typical area of Cascabel, Quiburi soils, and Typic Fluvaquents, Sonoran, 0 to 5 percent slopes along the San Pedro River about 11 miles north of Benson, Arizona.**

*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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Issued 2007



# Foreword

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This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it 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 survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey 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 shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

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

David McKay  
State Conservationist  
Natural Resources Conservation Service



# Soil Survey of Cochise County, Arizona, Northwestern Part

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By William A. Svetlik Jr.

Soil fieldwork by Donald J. Breckenfeld, William A. Svetlik Jr., Cathy E. McGuire, Nathan M. Starman, Jesse F. Wood, and Kyle W. Craig, Natural Resources Conservation Service

Ecological site identification and development by David D. Womack, Daniel G. Robinett, Emilio F. Carrillo, Donald D. Decker, and Wilma J. Renken, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with Redington Natural Resource Conservation District, San Pedro Natural Resource Conservation District, Willcox-San Simon Natural Resource Conservation District, and Arizona Agricultural Experiment Station

This survey area is in southeast corner of Arizona (fig. 1). The boundary of the area is in the northwestern corner of Cochise County extending south from the Graham-Cochise County line south to St David, Arizona, and from the Pima-Cochise county line on the west to the Winchester and Dragoon Mountains on the east. The survey area covers about 625,000 acres.

The survey area is part of the Sonoran and Southeastern Arizona section of the Basin and Range Physiographic Province, which is characterized by north-south trending ranges of mountains with broad basins or valley between the mountains. The survey area has a complex variety of terrain and soils. The vegetation ranges from that of desert shrub land to that of oak and pine woodland. Elevation ranges from 2,900 feet in an area along the San Pedro River near the northwestern corner of the Pima-Cochise county line to 6,726 feet in the Little Dragoon Mountains. The annual precipitation ranges from 10 to 20 inches. The mean annual air temperature ranges from 57 to 68 degrees F.

The survey has one major drainage system. The San Pedro River flows north out of Mexico. It is a perennial-intermittent river; certain sections of the river have water throughout the year, and other sections have running water only after periods of rainfall. The San Pedro River is one of the longest naturally occurring riparian areas left in the Southwest. The San Pedro drains into the Gila River at Winkelman, Arizona.

## General Nature of the Area

Ranching, farming, and mining are the main enterprises in the survey area. The major crops are alfalfa hay, pasture, and green manure crops. Sand and gravel, copper, and gypsum are mined from the survey area.

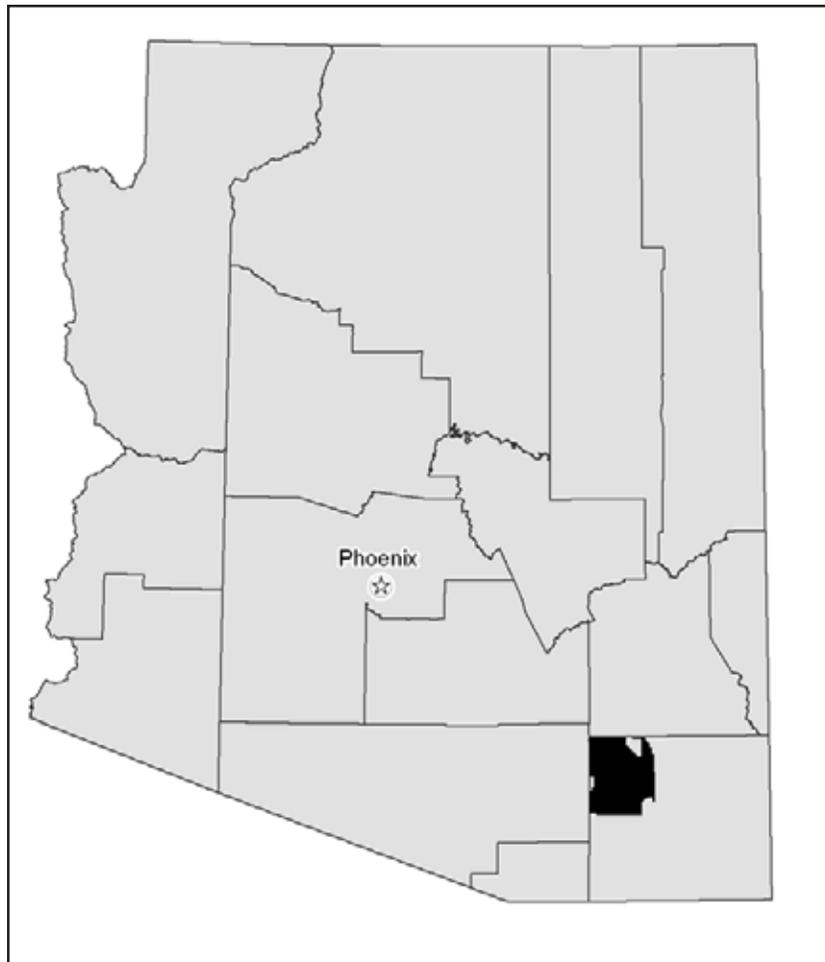


Figure 1.—Location of Cochise County, Arizona, Northwestern Part.

### **Transportation Facilities**

The only major Federal highway that serves the survey area is Interstate 10, which runs west to east through the southern part of survey area. No commercial airlines serve the survey area, but a small general aviation airport is located at Benson, Arizona.

### **How This Survey Was Made**

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The

unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

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

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

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

This survey was mapped at two levels of detail. At the more detailed level, map units are narrowly defined. Map unit boundaries were plotted and verified at closely spaced intervals. At the less detailed level, map units are broadly defined. Boundaries were plotted and verified at wider intervals. The detailed map unit occurs within the San Pedro River corridor. The detail of mapping was selected to meet the anticipated long-term use of the survey, and the map units were designed to meet the need for that use.

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

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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.

## Soil Map Unit Descriptions

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to 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. The contrasting components are mentioned in the map unit descriptions and listed under minor components. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

Soils that have profiles 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, Combate sandy loam, 0 to 5 percent slopes, is a phase of the Combate series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, 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. Mule-Paisano complex, 5 to 45 percent slopes, is an example.

An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Redington-Ripsey-Rock outcrop association, 15 to 70 percent slopes, is an example.

An undifferentiated group is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Cascabel, Quiburi, and Typic Fluvaquents soils and Water, Chihuahuan, 0 to 5 percent slopes, is an undifferentiated group in this survey area.

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

## 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 Aridisol.

**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 Argid (Arg, meaning argillic horizon, plus id, from Aridisol).

**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 Haplargids (Hapl, meaning minimal horizonation, plus argid, the suborder of the Aridisols that has an argillic horizon).

**SUBGROUP.** Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not

representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Typic identifies the subgroup that typifies the great group. The adjective Ustic identifies the subgroup having a soil moisture regime that borders on ustic. An example is Ustic Haplargids.

**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 fine-loamy, mixed, superactive, thermic Ustic Haplargids.

**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 Courtland 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, that 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 Division Staff, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (Soil Survey Staff, 1999) and in "Keys to Soil Taxonomy" (Soil Survey Staff, 2006). Unless otherwise indicated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

Some of the soil series described in this survey use the typical pedons for series described in the Soil Survey of Cochise County, Douglas-Tombstone Part, Arizona (Soil Survey Staff, 2000).

## **1—Agustin-Yturbide-Kokan complex, Chihuahuan, 1 to 8 percent slopes**

### **Map Unit Setting**

*Landform(s):* alluvial fans

*Elevation:* 2,900 to 3,800 feet (884 to 1,158 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### **Map Unit Composition**

Agustin, Chihuahuan, and similar soils: 55 percent

Yturbide, Chihuahuan, and similar soils: 25 percent

Kokan, Chihuahuan, and similar soils: 15 percent

85 percent rangeland

15 percent forest land (lower end of the alluvial fans closest to the river—Loamy Bottoms, *Prosopis glandulosa* var. *torreyana*-*Prosopis velutina*/*Sporobolus wrightii*, F041XB221AZ)

Minor components: Gila, Vinton, Stagecoach, Contention, Queencreek, Riverwash

## Soil Properties and Qualities

### Agustin, Chihuahuan soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Typic Haplocambids

*Geomorphic position:* inset between terraces and hills

*Parent material:* mixed fan alluvium

*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: 60 percent

Woody debris: 15 percent

Bare soil: 15 percent

Rock fragments:

- gravel: 10 percent

- cobble: 5 percent

*Drainage class:* well drained

*Ksat solum:* 1.98 to 39.69 inches per hour (14.00 to 280.00 micrometers per second)

*Available water capacity total inches:* 4.3 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* very rare

*Runoff class:* medium

*Hydrologic group:* B

*Ecological site name:* Limy Fan 8-12" p.z.

*Ecological site numbers:* R041XB206AZ

*Present vegetation:* mesquite, whitethorn acacia, bush muhly, sand dropseed, annual grasses, plains bristlegrass, Arizona cottontop, creosotebush, broom snakeweed, burroweed, desert zinnia, graythorn

*Land capability (nonirrigated):* 7c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse Mtn; about 1,600 feet north and 250 feet west of the southeast corner of section 17, Township 14 south, Range 20 east

*Geographic Coordinate System:* 32° 12' 5.00" north, 110° 18' 48.00" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; weak medium and thick platy structure parting to single grain; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine vesicular and tubular pores; 14 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bk1—2 to 10 inches (5 to 25 cm); brown (7.5YR 4/4) sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments and on faces of peds; 6

percent gravel; violently effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk2—10 to 21 inches (25 to 53 cm); brown (7.5YR 4/4) gravelly sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments and on faces of peds; 15 percent gravel; violently effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

2Ck—21 to 42 inches (53 to 107 cm); brown (7.5YR 5/4) very gravelly coarse sand, brown (7.5YR 4/4), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; many very fine roots; many very fine and fine interstitial pores; many continuous distinct carbonate coats on bottom surfaces of rock fragments; 37 percent gravel; violently effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

3Bkb—42 to 60 inches (107 to 152 cm); brown (7.5YR 5/4) gravelly sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; few very fine tubular pores; many continuous distinct carbonate coats on rock fragments; 19 percent gravel and 2 percent cobble; violently effervescent, 4 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 5 to 40 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 5 to 15 percent

Calcium carbonate equivalent: 0 to 5 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry and moist

Texture: sandy loam, loam, fine sandy loam

#### B and C horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, loamy sand, coarse sandy loam with strata of coarser materials

### Yturbide, Chihuahuan soils

*Taxonomic classification:* Mixed, thermic Typic Torripsamments

*Geomorphic position:* inset between terraces and hills

*Parent material:* mixed fan alluvium

*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: 65 percent

Woody debris: 5 percent

Bare soil: 25 percent

Rock fragments:

- gravel: 10 percent

*Drainage class:* excessively drained

*Ksat solum:* 5.95 to 39.69 inches per hour (42.00 to 280.00 micrometers per second)

*Available water capacity total inches:* 3.3 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* very rare

*Runoff class:* very low

*Hydrologic group:* A

*Ecological site name:* Sandy Loam Upland 8-12" p.z. Deep

*Ecological site numbers:* R041XB230AZ

*Present vegetation:* mesquite, catclaw acacia, bush muhly, annual grasses, graythorn, plains bristlegass, Arizona cottontop, sand dropseed, broom snakeweed, burroweed, desert zinnia

*Land capability (nonirrigated):* 7c

### Typical Profile

**Location**

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 1,000 feet east and 800 feet south of the northwest corner of section 21, Township 14 south, Range 20 east

*Geographic Coordinate System:* 32° 12' 2.00" north, 110° 18' 35.00" west

C—0 to 5 inches (0 to 13 cm); brown (7.5YR 5/3) gravelly coarse sand, brown (7.5YR 4/3), moist; 4 percent clay; weak thin platy parting to weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine interstitial pores; 17 percent gravel; strongly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Ck1—5 to 28 inches (13 to 71 cm); brown (7.5YR 5/3) loamy coarse sand, brown (7.5YR 4/3), moist; 4 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 14 percent gravel; violently effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Ck2—28 to 60 inches (71 to 152 cm); brown (7.5YR 5/4) sand, brown (7.5YR 4/4), moist; 4 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 14 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

### Range in Characteristics

Rock fragments: 5 to 30 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 1 to 7 percent

**C horizons**

Hue: 10YR, 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: loamy sand, sandy loam, sand, coarse sand, loamy coarse sand

### **Kokan, Chihuahuan soils**

*Taxonomic classification:* Sandy-skeletal, mixed, thermic Typic Torriorthents

*Geomorphic position:* inset between terraces and hills

*Parent material:* mixed fan alluvium

*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: 50 percent

Woody debris: 15 percent

Bare soil: 15 percent

Rock fragments:

- gravel: 25 percent

- cobble: 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:* 2.4 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* very rare

*Runoff class:* very low

*Hydrologic group:* A

*Ecological site name:* Limy Fan 8-12" p.z.

*Ecological site numbers:* R041XB206AZ

*Present vegetation:* whitethorn acacia, graythorn, Arizona cottontop, bush muhly, creosotebush, plains bristlegrass, annual grasses, broom snakeweed, burroweed, desert zinnia, sand dropseed

*Land capability (nonirrigated):* 7c

### **Typical Profile**

#### *Location*

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 650 feet west and 1,150 feet south of the northeast corner of section 17, Township 14 south, Range 20 east

*Geographic Coordinate System:* 32° 13' 15.00" north, 110° 18' 55.00" west

C—0 to 4 inches (0 to 10 cm); brown (7.5YR 5/3) very gravelly loamy sand, brown (7.5YR 4/3), moist; 5 percent clay; weak thin platy parting to weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine vesicular pores; 37 percent gravel; violently effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Ck1—4 to 16 inches (10 to 41 cm); brown (7.5YR 5/4) very gravelly loamy sand, brown (7.5YR 4/4), moist; 5 percent clay; massive; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; 36 percent gravel; violently effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Ck2—16 to 52 inches (41 to 132 cm); light brown (7.5YR 6/4) very gravelly coarse sand, brown (7.5YR 5/4), moist; 5 percent clay; single grain; loose, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; many patchy faint carbonate coats on rock fragments; 48 percent gravel and 5 percent cobble; violently effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Ck3—52 to 60 inches (132 to 152 cm); light brown (7.5YR 6/4) extremely gravelly loamy sand, brown (7.5YR 5/4), moist; 5 percent clay; single grain; loose, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 54 percent gravel and 10 percent cobble; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 35 to 70 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 1 to 10 percent

Calcium carbonate equivalent: 0 to 5 percent

C horizons

Hue: 10YR, 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist sand, sand, loamy sand, sandy loam

## 2—Agustin-Yturbide-Kokan complex, Sonoran, 1 to 8 percent slopes

### Map Unit Setting

*Landform(s)*: alluvial fans

*Elevation*: 2,900 to 3,800 feet (884 to 1,158 meters)

*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature*: 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period*: 190 to 260 days

*Major Land Resource Area*: 40; Sonoran Basin and Range

*Land Resource Unit*: 40-1; Upper Sonoran Desert Shrub

### Map Unit Composition

Agustin, Sonoran, and similar soils: 55 percent

Yturbide, Sonoran, and similar soils: 25 percent

Kokan, Sonoran, and similar soils: 15 percent

85 percent rangeland

15 percent forest land (lower end of the alluvial fans closest to the river—Loamy Bottoms, *Prosopis velutina*/*Sporobolus wrightii*, F040XA124AZ)

Minor components: Gila, Vinton, Stagecoach, Contention, Queencreek, Riverwash

### Soil Properties and Qualities

#### Agustin, Sonoran soils

*Taxonomic classification*: Coarse-loamy, mixed, superactive, thermic Typic Haplocambids

*Geomorphic position*: inset between terraces and hills

*Parent material*: mixed fan alluvium

*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: 60 percent

Woody debris: 15 percent

Bare soil: 15 percent

Rock fragments:

- gravel: 10 percent

- cobble: 5 percent

*Drainage class:* well drained

*Ksat solum:* 1.98 to 39.69 inches per hour (14.00 to 280.00 micrometers per second)

*Available water capacity total inches:* 4.3 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* very rare

*Runoff class:* medium

*Hydrologic group:* B

*Ecological site name:* Limy Fan 10-13" p.z.

*Ecological site numbers:* R040XA108AZ

*Present vegetation:* creosotebush, mesquite, whitethorn acacia, bush muhly, sand dropseed, annual grasses, plains bristlegrass, Arizona cottontop, broom snakeweed, burroweed, desert zinnia, graythorn

*Land capability (nonirrigated):* 7c

## Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—Wildhorse Mtn; about 1,600 feet north and 250 feet west of the southeast corner of section 17, Township 14 south, Range 20 east

*Geographic Coordinate System:* 32° 12' 5.00" north, 110° 18' 48.00" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; weak medium and thick platy structure parting to single grain; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine vesicular and fine tubular pores; 14 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bk1—2 to 10 inches (5 to 25 cm); brown (7.5YR 4/4) sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments and on faces of peds; 6 percent gravel; violently effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk2—10 to 21 inches (25 to 53 cm); brown (7.5YR 4/4) gravelly sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments and on faces of peds; 15 percent gravel; violently effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

2Ck—21 to 42 inches (53 to 107 cm); brown (7.5YR 5/4) very gravelly coarse sand, brown (7.5YR 4/4), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; many very fine roots; many very fine and fine interstitial pores; many continuous distinct carbonate coats on bottom surfaces of rock fragments; 37 percent gravel; violently effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

3Bkb—42 to 60 inches (107 to 152 cm); brown (7.5YR 5/4) gravelly sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; few very fine tubular pores; many continuous distinct carbonate coats on rock fragments; 19 percent gravel and 2 percent cobble; violently effervescent, 4 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 5 to 40 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 5 to 15 percent

Calcium carbonate equivalent: 0 to 5 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry and moist

Texture: sandy loam, loam, fine sandy loam

#### B and C horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, loamy sand, coarse sandy loam with strata of coarser materials

### Yturbide, Sonoran soils

*Taxonomic classification:* Mixed, thermic Typic Torripsamments

*Geomorphic position:* inset between terraces and hills

*Parent material:* mixed fan alluvium

*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: 65 percent

Woody debris: 5 percent

Bare soil: 25 percent

Rock fragments:

- gravel: 10 percent

*Drainage class:* excessively drained

*Ksat solum:* 5.95 to 39.69 inches per hour (42.00 to 280.00 micrometers per second)

*Available water capacity total inches:* 3.3 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* very rare

*Runoff class:* very low

*Hydrologic group:* A

*Ecological site name:* Sandy Loam Upland 10-13" p.z. Deep

*Ecological site numbers:* R040XA117AZ

*Present vegetation:* mesquite, bush muhly, whitethorn acacia, annual grasses, graythorn, plains bristleglass, Arizona cottontop, sand dropseed, broom snakeweed, burroweed, desert zinnia

*Land capability (nonirrigated):* 7c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 1,000 feet east and 800 feet south of the northwest corner of section 21, Township 14 south, Range 20 east

*Geographic Coordinate System:* 32° 12' 2.00" north, 110° 18' 35.00" west

C—0 to 5 inches (0 to 13 cm); brown (7.5YR 5/3) gravelly coarse sand, brown (7.5YR 4/3), moist; 4 percent clay; weak thin platy parting to weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine interstitial pores; 17 percent gravel; strongly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Ck1—5 to 28 inches (13 to 71 cm); brown (7.5YR 5/3) loamy coarse sand, brown (7.5YR 4/3), moist; 4 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 14 percent gravel; violently effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Ck2—28 to 60 inches (71 to 152 cm); brown (7.5YR 5/4) sand, brown (7.5YR 4/4), moist; 4 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 14 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

### Range in Characteristics

Rock fragments: 5 to 30 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 1 to 7 percent

#### C horizons

Hue: 10YR, 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: loamy sand, sandy loam, sand, coarse sand, loamy coarse sand

#### **Kokan, Sonoran soils**

*Taxonomic classification:* Sandy-skeletal, mixed, thermic Typic Torriorthents

*Geomorphic position:* inset between terraces and hills

*Parent material:* mixed fan alluvium

*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: 50 percent  
   Woody debris: 15 percent  
   Bare soil: 15 percent  
   Rock fragments:  
     • gravel: 25 percent  
     • cobble: 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:* 2.4 (very low)  
*Shrink-swell potential:* about 1.5 LEP (low)  
*Flooding hazard:* very rare  
*Runoff class:* very low  
*Hydrologic group:* A  
*Ecological site name:* Limy Fan 10-13" p.z.  
*Ecological site numbers:* R040XA108AZ  
*Present vegetation:* whitethorn acacia, graythorn, Arizona cottontop, bush muhly, creosotebush, plains bristlegrass, annual grasses, broom snakeweed, burroweed, desert zinnia, sand dropseed  
*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 650 feet west and 1,150 feet south of the northeast corner of section 17, Township 14 south, Range 20 east

*Geographic Coordinate System:* 32° 13' 15.00" north, 110° 18' 55.00" west

C—0 to 4 inches (0 to 10 cm); brown (7.5YR 5/3) very gravelly loamy sand, brown (7.5YR 4/3), moist; 5 percent clay; weak thin platy parting to weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine vesicular pores; 37 percent gravel; violently effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Ck1—4 to 16 inches (10 to 41 cm); brown (7.5YR 5/4) very gravelly loamy sand, brown (7.5YR 4/4), moist; 5 percent clay; massive; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; 36 percent gravel; violently effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Ck2—16 to 52 inches (41 to 132 cm); light brown (7.5YR 6/4) very gravelly coarse sand, brown (7.5YR 5/4), moist; 5 percent clay; single grain; loose, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; many patchy faint carbonate coats on rock fragments; 48 percent gravel and 5 percent cobble; violently effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Ck3—52 to 60 inches (132 to 152 cm); light brown (7.5YR 6/4) extremely gravelly loamy sand, brown (7.5YR 5/4), moist; 5 percent clay; single grain; loose, nonsticky

and nonplastic; many very fine roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 54 percent gravel and 10 percent cobble; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 35 to 70 percent  
 Reaction: 7.4 to 8.4 (slightly to moderately alkaline)  
 Average clay content in the control section: 1 to 10 percent  
 Calcium carbonate equivalent: 0 to 5 percent

#### C horizons

Hue: 10YR, 7.5YR  
 Value: 4 to 6 dry, 3 to 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: coarse sand, loamy coarse sand, sand, loamy sand, sandy loam

## 3—Anthony-Maricopa complex, 0 to 5 percent slopes

### Map Unit Setting

*Landform(s):* alluvial fans  
*Elevation:* 3,500 to 3,800 feet (1,067 to 1,158 meters)  
*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)  
*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)  
*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)  
*Frost-free period:* 190 to 260 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### Map Unit Composition

Anthony and similar soils: 45 percent  
 Maricopa and similar soils: 40 percent  
 Minor components: Riverwash, Borderline, Glendale, Contention, and soils that contain gypsum at moderate depths.

### Soil Properties and Qualities

#### Anthony soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, calcareous, thermic  
 Typic Torrfluvents  
*Geomorphic position:* inset between terraces  
*Parent material:* mixed stream alluvium  
*Slope:* 0 to 5 percent  
*Surface cover:*  
 Biological crust  
 Cyanobacteria: 0 percent  
 Lichen: 0 percent  
 Moss: 0 percent  
 Chemical crust  
 Salt: 0 percent  
 Gypsum: 0 percent  
 Physical cover  
 Canopy plant cover: 90 percent  
 Woody debris: 5 percent

Bare soil: 5 percent  
 Rock fragments: 0 percent  
*Drainage class*: well drained  
*Ksat solum*: 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)  
*Available water capacity total inches*: 6.6 (moderate)  
*Shrink-swell potential*: about 1.5 LEP (low)  
*Flooding hazard*: rare  
*Runoff class*: low  
*Hydrologic group*: B  
*Ecological site name*: Sandy Loam Upland 8-12" p.z.  
*Ecological site number*: R041XB215AZ  
*Present vegetation*: black grama, bush muhly, littleleaf ratany, rabo de ardilla, sideoats grama, soaptree yucca, threeawn  
*Land capability (irrigated)*: 3e  
*Land capability (nonirrigated)*: 7c

### Typical Profile

#### Location

*Public Land Survey*: Typical pedon is from the Soil Survey of Cochise County, Arizona, Douglas-Tombstone Part (Soil Survey Staff, 2000); USGS Quadrangle—Saint David; about 1,950 feet east and 800 feet north of the southwest corner of section 9, Township 18 south, Range 21 east

*Geographic Coordinate System*: 31° 52' 39.00" north, 110° 12' 27.00" west

C1—0 to 15 inches (0 to 38 cm); brown (7.5YR 4/3) sandy loam, dark brown (7.5YR 3/3), moist; 12 percent clay; massive; soft, very friable, nonsticky and nonplastic; few fine roots; few fine irregular pores; 3 percent gravel; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

C2—15 to 40 inches (38 to 102 cm); brown (7.5YR 5/3) sandy loam, brown (7.5YR 4/3), moist; 12 percent clay; massive; soft, very friable, nonsticky and nonplastic; few fine roots; few fine irregular pores; 3 percent gravel; strongly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C3—40 to 60 inches (102 to 152 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 12 percent clay; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few fine irregular pores; 5 percent gravel; slightly effervescent; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 0 to 15 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in the control section: 3 to 15

#### C horizons

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4 dry, 2 to 4 moist

Texture: sandy loam

#### Maricopa soils

*Taxonomic classification*: Coarse-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, thermic Typic Torrifuvents

*Geomorphic position*: inset between terraces

*Parent material*: mixed stream alluvium

*Slope*: 0 to 5 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 90 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments: 0 percent

*Depth to restrictive feature(s):* 20 to 40 inches to strongly contrasting textural stratification*Drainage class:* well drained*Ksat solum:* 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)*Available water capacity total inches:* 2.6 (low)*Shrink-swell potential:* about 1.5 LEP (low)*Flooding hazard:* rare*Runoff class:* low*Hydrologic group:* B*Ecological site name:* Sandy Wash 8-12" p.z.*Ecological site number:* R041XB213AZ*Present vegetation:* giant sacaton, Arizona cottontop, bush muhly, sideoats grama, velvet mesquite, Fremont chaffbush, Rothrock's grama, catclaw acacia, longleaf jointfir, rabbitbrush, singlewhorl burrobush, soaptree yucca*Land capability (irrigated):* 3e*Land capability (nonirrigated):* 7c**Typical Profile***Location**Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Arizona, Douglas-Tombstone Part; USGS Quadrangle—Saint David; about 2,750 feet east and 1,300 feet north of the southwest corner of section 9, Township 18 south, Range 21 east*Geographic Coordinate System:* 31° 52' 45.00" north, 110° 12' 18.00" west

C1—0 to 5 inches (0 to 13 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 10 percent clay; massive; soft, very friable, nonsticky and nonplastic; common fine roots; few fine irregular pores; 2 percent gravel; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

C2—5 to 24 inches (13 to 61 cm); brown (7.5YR 4/3) sandy loam, dark brown (7.5YR 3/3), moist; 10 percent clay; massive; soft, very friable, nonsticky and nonplastic; common fine roots; few fine irregular pores; 5 percent gravel; strongly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

2C3—24 to 60 inches (61 to 152 cm); brown (7.5YR 5/3) gravelly sand, brown (7.5YR 4/3), moist; 3 percent clay; massive; loose, nonsticky and nonplastic; few fine roots; few fine irregular pores; 20 percent gravel; strongly effervescent; slightly alkaline, pH 7.8.

**Range in Characteristics**

Rock fragments: 0 to 25 percent in the upper part and 20 to 50 percent in the lower horizons

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)  
 Average percentage of clay in the control section: 3 to 15

C horizons

Hue: 10YR, 7.5YR  
 Value: 4 or 5, dry or moist  
 Chroma: 3 to 6 dry, 3 or 4 moist  
 Texture: sandy loam, sand, coarse sand

## 4—Ashcreek silty clay loam, 0 to 5 percent slopes

### Map Unit Setting

*Landform(s)*: flood plains  
*Elevation*: 4,400 to 5,600 feet (1,341 to 1,707 meters)  
*Mean annual precipitation*: 16 to 20 inches (406 to 508 millimeters)  
*Mean annual air temperature*: 57 to 62 degrees F (13.9 to 16.7 degrees C)  
*Mean annual soil temperature*: 59 to 64 degrees F (15.0 to 17.8 degrees C)  
*Frost-free period*: 160 to 210 days  
*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range  
*Land Resource Unit*: 41-1; Mexican Oak-Pinyon Woodland and Oak Savannah

### Map Unit Composition

Ashcreek and similar soils: 90 percent  
 Minor components: Rafter, Blacktail, Terrarossa

### Soil Properties and Qualities

#### Ashcreek soils

*Taxonomic classification*: Fine, smectitic, thermic Torrertic Haplustolls  
*Geomorphic position*: intermixed dips and rises  
*Parent material*: mixed stream alluvium  
*Slope*: 0 to 5 percent  
*Surface cover*:  
   Biological crust  
     Cyanobacteria: 0 percent  
     Lichen: 0 percent  
     Moss: 0 percent  
   Chemical crust  
     Salt: 0 percent  
     Gypsum: 0 percent  
   Physical cover  
     Canopy plant cover: 45 percent  
     Woody debris: 0 percent  
     Bare soil: 55 percent  
     Rock fragments: 0 percent  
*Drainage class*: well drained  
*Ksat solum*: 0.00 to 0.57 inches per hour (0.01 to 4.00 micrometers per second)  
*Available water capacity total inches*: 9.3 (high)  
*Shrink-swell potential*: about 10.0 LEP (very high)  
*Flooding hazard*: occasional  
*Runoff class*: medium  
*Hydrologic group*: D

*Ecological site name:* Clayey Swale 16-20" p.z.

*Ecological site number:* R041XA101AZ

*Present vegetation:* tobosa, annual grasses, mesquite, perennial forbs, vine mesquite, sideoats grama, blue grama, curly mesquite

*Land capability (nonirrigated):* 6c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Deepwell Ranch; about 4,800 feet west and 2,800 feet north of the southeast corner of section 6, Township 14 south, Range 22 east

*Geographic Coordinate System:* 32° 14' 48.70" north, 110° 8' 29.80" west

A—0 to 1 inch (0 to 3 cm); brown (7.5YR 4/3) silty clay loam, black (7.5YR 2.5/1), moist; 34 percent clay; strong thin and thick platy structure; soft, very friable, moderately sticky and moderately plastic; common very fine and fine and many medium roots; many very fine tubular and vesicular pores; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

Bw1—1 inch to 10 inches (3 to 25 cm); brown (7.5YR 4/3) silty clay, black (7.5YR 2.5/1), moist; 42 percent clay; strong fine and medium subangular blocky and wedge structure; hard, firm, very sticky and very plastic; many very fine and fine roots; many very fine tubular pores; many continuous distinct pressure faces; noneffervescent; neutral, pH 6.6; abrupt wavy boundary.

Bw2—10 to 38 inches (25 to 97 cm); very dark gray (7.5YR 3/1) clay, black (7.5YR 2.5/1), moist; 56 percent clay; strong fine, medium, and coarse angular blocky and wedge structure; extremely hard, very firm, very sticky and very plastic; common very fine roots; many very fine tubular pores; many continuous distinct pressure faces; noneffervescent; neutral, pH 6.6; clear smooth boundary.

Bw3—38 to 60 inches (97 to 152 cm); very dark gray (7.5YR 3/1) clay, black (7.5YR 2.5/1), moist; 56 percent clay; strong fine and medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine roots; many very fine tubular pores; many continuous distinct pressure faces; noneffervescent; neutral, pH 6.6.

### Range in Characteristics

Soil cracks: many vertical cracks 0.25 to 0.5 inch wide from surface to 40 inches

Rock fragments: 0 to 10 percent

Organic matter content: 1 to 2 percent

Reaction: 6.6 to 7.3 (neutral)

Average percentage of clay in the control section: 35 to 60 percent

#### A horizon

Hue: 7.5YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 2 or 3 dry, 1 or 2 moist

Texture: clay loam, silty clay loam

#### Bw horizons

Hue: 7.5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 to 3 dry, 1 or 2 moist

Texture: clay, silty clay

## 5—Blacktail-Murray complex, 1 to 40 percent slopes

### Map Unit Setting

*Landform(s):* fan terraces

*Elevation:* 4,400 to 5,600 feet (1,341 to 1,707 meters)

*Mean annual precipitation:* 16 to 20 inches (406 to 508 millimeters)

*Mean annual air temperature:* 57 to 62 degrees F (13.9 to 16.7 degrees C)

*Mean annual soil temperature:* 59 to 64 degrees F (15.0 to 17.8 degrees C)

*Frost-free period:* 160 to 210 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-1; Mexican Oak-Pinyon Woodland and Oak Savannah

### Map Unit Composition

Blacktail and similar soils: 65 percent

Murray and similar soils: 20 percent

Minor components: Hathaway, Carbine, and soils containing less than 18 percent clay.

### Soil Properties and Qualities

#### Blacktail soils

*Taxonomic classification:* Fine, mixed, superactive, thermic Calcic Argiustolls

*Geomorphic position:* shoulders

*Parent material:* mixed fan alluvium

*Slope:* 1 to 40 percent

*Surface cover:*

Biological crust

    Cyanobacteria: 0 percent

    Lichen: 0 percent

    Moss: 0 percent

Chemical crust

    Salt: 0 percent

    Gypsum: 0 percent

Physical cover

    Canopy plant cover: 45 percent

    Woody debris: 0 percent

    Bare soil: 5 percent

    Rock fragments:

        • gravel: 45 percent

        • cobble: 10 percent

*Drainage class:* well drained

*Ksat solum:* 0.06 to 0.57 inches per hour (0.42 to 4.00 micrometers per second)

*Available water capacity total inches:* 8.1 (high)

*Shrink-swell potential:* about 7.5 LEP (high)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* C

*Ecological site name:* Loamy Slopes 16-20" p.z.

*Ecological site number:* R041XA107AZ

*Present vegetation:* annual grasses, cane beardgrass, perennial forbs, sideoats grama, bullgrass, plains lovegrass, black grama, curly mesquite, sacahuista, shrubby buckwheat, mesquite

*Land capability (nonirrigated):* 6c

## Typical Profile

### *Location*

*Public Land Survey:* USGS Quadrangle—Hookers Hot Springs; about 2,500 feet north and 1,500 feet east of the southeast corner of section 23, Township 13 south, Range 21 east

*Geographic Coordinate System:* 32° 17' 17.10" north, 110° 10' 12.50" west

A—0 to 1 inch (0 to 3 cm); brown (7.5YR 4/3) sandy clay loam, dark brown (7.5YR 3/3), moist; 25 percent clay; moderate thin platy parting to weak fine granular structure; soft, very friable, very sticky and very plastic; many very fine and fine roots; many very fine tubular pores; 10 percent gravel; noneffervescent; neutral, pH 7.2; abrupt smooth boundary.

Bt1—1 inch to 7 inches (3 to 18 cm); dark reddish brown (5YR 3/3) clay, dark reddish brown (2.5YR 3/3), moist; 52 percent clay; strong very fine and fine subangular blocky structure; slightly hard, friable, very sticky and very plastic; common very fine and fine and few medium and coarse roots; many very fine tubular pores; many continuous distinct clay films on faces of peds and on rock fragments; 5 percent gravel; noneffervescent; neutral, pH 7.0; abrupt smooth boundary.

Bt2—7 to 17 inches (18 to 43 cm); reddish brown (5YR 4/3) clay, dark reddish brown (2.5YR 3/3), moist; 58 percent clay; strong fine and medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine and medium roots; many very fine tubular pores; many continuous distinct clay films on faces of peds and on rock fragments; common distinct manganese stains on faces of peds; 5 percent gravel; noneffervescent; neutral, pH 7.2; abrupt smooth boundary.

Btk1—17 to 45 inches (43 to 114 cm); 20 percent pink (7.5YR 8/3) and 80 percent brown (7.5YR 4/4) gravelly clay, brown (7.5YR 4/4), moist; 42 percent clay; moderate very fine and fine subangular blocky structure; extremely hard, firm, very sticky and very plastic; few very fine roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; many continuous distinct carbonate coats on rock fragments and on faces of peds; many fine carbonate masses; 15 percent gravel; violently effervescent, 31 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Btk2—45 to 60 inches (114 to 152 cm); 30 percent pinkish white (5YR 8/2) and 70 percent yellowish red (5YR 4/6) clay, yellowish red (5YR 4/6), moist; 45 percent clay; moderate fine subangular blocky structure; extremely hard, firm, very sticky and very plastic; few very fine roots; many very fine interstitial pores; many continuous distinct clay films on rock fragments and on faces of peds; many continuous distinct carbonate coats on rock fragments and on faces of peds; many fine and medium carbonate masses; 10 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

## Range in Characteristics

Rock fragments: 5 to 30 percent

Organic matter: 1 to 2 percent

Average percentage of clay in the control section: 40 to 60 percent

### A horizon

Hue: 7.5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 2 or 3 dry, or moist

Texture: clay, clay loam, sandy clay loam

Reaction: 6.1 to 7.3 (slightly acid to neutral)

**Bt horizons**

Hue: 2.5YR, 5YR, 7.5YR  
 Value: 3 or 4 dry, 2 or 3 moist  
 Chroma: 3 or 4 dry, 2 or 3 moist  
 Texture: clay  
 Reaction: 6.1 to 7.3 (slightly acid to neutral)

**Btk horizons**

Hue: 5YR, 7.5YR  
 Value: 4 to 8 dry, 3 to 6 moist  
 Chroma: 2 to 6 dry, 3 to 6 moist  
 Texture: clay  
 Reaction: 7.4 to 8.4 (slightly to moderately alkaline)  
 Calcium carbonate content: 5 to 35 percent

**Murray soils**

*Taxonomic classification:* Fine-loamy, mixed, superactive, thermic Aridic Calcistolls

*Geomorphic position:* side slopes

*Parent material:* mixed calcareous fan alluvium

*Slope:* 1 to 40 percent

*Surface cover:*

## Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

## Chemical crust

Salt: 0 percent

Gypsum: 0 percent

## Physical cover

Canopy plant cover: 40 percent

Woody debris: 5 percent

Bare soil: 50 percent

Rock fragments:

- gravel: 5 percent

*Drainage class:* well drained

*Ksat solum:* 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

*Available water capacity total inches:* 7.2 (high)

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Limy Slopes 16-20" p.z.

*Ecological site number:* R041XA104AZ

*Present vegetation:* annual grasses, black grama, perennial forbs, sideoats grama, burroweed, fluffgrass, mesquite, banana yucca, sacahuista, soaptree yucca, sotol

*Land capability (nonirrigated):* 6c

**Typical Profile***Location*

*Public Land Survey:* USGS Quadrangle—Hookers Hot Springs; about 2,100 feet north and 2,000 feet west of the southeast corner of section 23, Township 13 south, Range 21 east

*Geographic Coordinate System:* 32° 17' 17.50" north, 110° 10' 19.10" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) sandy loam, brown (7.5YR 4/3), moist; 12 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine and fine vesicular and tubular pores; slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bk1—2 to 16 inches (5 to 41 cm); brown (7.5YR 5/3) clay loam, brown (7.5YR 4/3), moist; 30 percent clay; moderate very fine and fine subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; many very fine and common fine and few medium roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; few fine carbonate masses; 10 percent gravel; violently effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bk2—16 to 43 inches (41 to 109 cm); light brown (7.5YR 6/3) gravelly sandy clay loam, brown (7.5YR 5/3), moist; 26 percent clay; moderate fine and medium subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; many very fine roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; many fine carbonate masses; 20 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

2Bk—43 to 60 inches (109 to 152 cm); light brown (7.5YR 6/4) very gravelly sandy loam, brown (7.5YR 5/4), moist; 15 percent clay; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; 30 percent gravel and 10 percent cobble; violently effervescent, 18 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### **Range in Characteristics**

Organic matter: 1 to 2 percent

Reaction: 7.4–8.4 (slightly to moderately alkaline)

Average percentage of clay in the control section: 20 to 35 percent

Calcium carbonate equivalent: 5 to 20 percent

#### **A horizon**

Hue: 7.5YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 2 or 3 dry, or moist

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

#### **Bk horizons**

Hue: 7.5YR

Value: 4 to 6 dry, 2 to 5 moist

Chroma: 2 to 4 dry, or moist

Texture: loam, sandy clay loam, clay loam

Rock fragments: 10 to 25 percent

#### **2Bk horizon**

Hue: 7.5YR

Value: 4 to 6 dry, 2 to 5 moist

Chroma: 2 to 4 dry, or moist

Texture: loam, sandy loam

Rock fragments: 20 to 45 percent

## 6—Blakeney family-Luckyhills complex, 3 to 15 percent slopes

### Map Unit Setting

*Landform(s)*: fan terraces

*Elevation*: 3,900 to 4,600 feet (1,189 to 1,402 meters)

*Mean annual precipitation*: 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature*: 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature*: 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period*: 180 to 230 days

*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range

*Land Resource Unit*: 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Blakeney family and similar soils: 60 percent

Luckyhills and similar soils: 30 percent

Minor components: Bodecker, Tombstone

### Soil Properties and Qualities

#### Blakeney family

*Taxonomic classification*: Loamy, mixed, superactive, thermic, shallow Ustic Petrocalcids

*Geomorphic position*: shoulder

*Parent material*: mixed calcareous fan alluvium

*Slope*: 3 to 15 percent

*Surface cover*:

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 40 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

- gravel: 75 percent

- cobble: 3 percent

*Depth to restrictive feature(s)*: 5 to 20 inches to petrocalcic

*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*: 0.4 (very low)

*Shrink-swell potential*: about 1.5 LEP (low)

*Flooding hazard*: none

*Runoff class*: high

*Hydrologic group*: D

*Ecological site name*: Limy Upland 12-16" p.z.

*Ecological site number*: R041XC309AZ

*Present vegetation:* Texas dogweed, whitethorn acacia, banana yucca, creosotebush, desert zinnia, range ratany, condalia, false mesquite, littleleaf sumac, mariola, tarbush, blue threeawn

*Land capability (nonirrigated):* 6c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Knob Hill; about 900 feet north and 700 feet east of the southwest corner of section 2, Township 17 south, Range 22 east

*Geographic Coordinate System:* 31° 58' 50.10" north, 110° 4' 2.70" west

A—0 to 0.5 inch (0 to 1 cm); brown (10YR 5/3) gravelly sandy loam, dark grayish brown (10YR 4/2), moist; 10 percent clay; weak thin platy structure parting to single grain; soft, very friable, nonsticky and nonplastic; few very fine roots; common very fine vesicular pores; few patchy distinct carbonate coats on rock fragments; 15 percent gravel; strongly effervescent, 13 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Bk—0.5 to 5 inches (1 to 13 cm); brown (10YR 5/3) gravelly sandy loam, very dark grayish brown (10YR 3/2), moist; 10 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; common very fine and fine tubular and irregular pores; many patchy distinct carbonate coats on rock fragments; few fine carbonate masses; 15 percent gravel and 5 percent cobble; strongly effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bkm—5 to 60 inches (13 to 152 cm); cemented material, indurated, 1/8- to ¼-inch thick laminar cap; cemented by calcium carbonates and silica.

### Range in Characteristics

Rock fragments: 5 to 25 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 5 to 18 percent

Calcium carbonate equivalent: 5 to 15 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

Texture: loam, sandy loam

#### Bk horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

Texture: loam, fine sandy loam, sandy loam

#### Bkm horizon

Cemented: calcium carbonate

Hardness: very strongly cemented to indurated

Thickness: 1 foot to 3 feet

Blakeney series is moist in the soil moisture control section during May and June, and occurs in the Great Plains.

### Luckyhills soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Ustic Haplocalcids

*Geomorphic position:* side slopes

*Parent material:* mixed calcareous fan alluvium

*Slope:* 3 to 15 percent

*Surface cover:*

Biological crust

  Cyanobacteria: 0 percent

  Lichen: 0 percent

  Moss: 0 percent

Chemical crust

  Salt: 0 percent

  Gypsum: 0 percent

Physical cover

  Canopy plant cover: 40 percent

  Woody debris: 5 percent

  Bare soil: 40 percent

  Rock fragments:

    • gravel: 15 percent

*Drainage class:* well drained

*Ksat solum:* 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

*Available water capacity total inches:* 7.4 (high)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* medium

*Hydrologic group:* B

*Ecological site name:* Limy Upland 12-16" p.z.

*Ecological site number:* R041XC309AZ

*Present vegetation:* desert zinnia, whitethorn acacia, creosotebush, littleleaf sumac, paperflower, banana yucca, tarbush, Texas dogweed, range ratany, bush muhly, condalia, false mesquite, blue threeawn, mariola

*Land capability (nonirrigated):* 6c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—Knob Hill; about 2,400 feet north and 1,700 feet east of the southwest corner of section 3, Township 17 south, Range 22 east

*Geographic Coordinate System:* 31° 59' 4.50" north, 110° 5' 22.70" west

A—0 to 2 inches (0 to 5 cm); pale brown (10YR 6/3) sandy loam, brown (10YR 4/3), moist; 12 percent clay; strong thin and medium platy structure; soft, very friable, slightly sticky and nonplastic; common very fine roots; many very fine vesicular pores; 5 percent gravel; strongly effervescent, 11 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Bk1—2 to 21 inches (5 to 53 cm); pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3), moist; 12 percent clay; strong very fine and fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; many very fine and fine tubular and irregular pores; few very fine carbonate masses; strongly effervescent, 24 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk2—21 to 34 inches (53 to 86 cm); pale brown (10YR 6/3) loam, brown (10YR 5/3), moist; 15 percent clay; strong very fine and fine subangular blocky; moderately hard, firm, moderately sticky and very plastic; many very fine and fine roots; many very fine and fine irregular and tubular pores; common fine carbonate masses; violently effervescent, 30 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bk3—34 to 60 inches (86 to 152 cm); pink (7.5YR 7/3) sandy loam, light yellowish brown (10YR 6/4), moist; 15 percent clay; massive; very hard, very firm, moderately sticky and moderately plastic; many very fine and fine roots; many very fine and fine irregular and tubular pores; many fine carbonate masses and nodules; 5 percent gravel; violently effervescent, 31 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 0 to 20 percent  
 Reaction: 7.4 to 8.4 (slightly to moderately alkaline)  
 Average percentage of clay in the control section: 7 to 18 percent  
 Calcium carbonate equivalent: 5 to 35 percent

#### A horizon

Hue: 7.5YR, 10YR  
 Value: 5 to 7 dry, 3 to 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: loam, sandy loam, fine sandy loam

#### Bk horizon

Hue: 7.5YR, 10YR  
 Value: 5 to 8 dry, 4 to 7 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: loam, fine sandy loam, sandy loam

## 7—Bodecker-Riverwash complex, 0 to 3 percent slopes

### Map Unit Setting

*Landform(s):* flood plains  
*Elevation:* 3,800 to 5,200 feet (1,158 to 1,585 meters)  
*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)  
*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)  
*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)  
*Frost-free period:* 180 to 230 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Bodecker and similar soils: 55 percent  
 Riverwash: 30 percent  
 Minor components: Combate, Bodecker, Durazo and soils that are calcareous and have thicker surface layers

### Soil Properties and Qualities

#### Bodecker soils

*Taxonomic classification:* Sandy-skeletal, mixed, thermic Ustic Torriorthents  
*Geomorphic position:* higher and adjacent to Riverwash  
*Parent material:* mixed stream alluvium  
*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: 60 percent  
   Woody debris: 5 percent  
   Bare soil: 35 percent  
   Rock fragments:  
     • gravel: 5 percent  
*Drainage class:* excessively drained  
*Ksat solum:* 19.98 to 39.69 inches per hour (141.00 to 280.00 micrometers per second)  
*Available water capacity total inches:* 2.1 (very low)  
*Shrink-swell potential:* about 1.5 LEP (low)  
*Flooding hazard:* occasional  
*Runoff class:* negligible  
*Hydrologic group:* A  
*Ecological site name:* Sandy Wash 12-16" p.z.  
*Ecological site number:* R041XC316AZ  
*Present vegetation:* mesquite, sideoats grama, catclaw acacia, Arizona cottontop, desert willow  
*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Benson; about 1,300 feet north and 1,250 feet west of the southeast corner of section 19, Township 17 south, Range 20 east  
*Geographic Coordinate System:* 31° 56' 17.10" north, 110° 20' 4.20" west

C1—0 to 4 inches (0 to 10 cm); brown (7.5YR 5/4) gravelly coarse sand, brown (7.5YR 4/4), moist; 5 percent clay; weak thin platy structure parting to single grain; loose, nonsticky and nonplastic; many very fine and fine roots; many fine interstitial pores; 25 percent gravel; noneffervescent; neutral, pH 6.6; clear smooth boundary.

C2—4 to 34 inches (10 to 86 cm); brown (7.5YR 5/4) very gravelly coarse sand, brown (7.5YR 4/4), moist; 5 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine and few medium roots; many fine interstitial pores; 40 percent gravel; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

C3—34 to 60 inches (86 to 152 cm); brown (7.5YR 4/4) very gravelly coarse sand, dark brown (7.5YR 3/4), moist; 5 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; many fine interstitial pores; 55 percent gravel; noneffervescent; neutral, pH 7.2.

### Range in Characteristics

Rock fragments: 20 to 60 percent, averages more than 35 percent  
 Reaction: 6.6 to 7.8 (neutral to slightly alkaline)  
 Average clay content in the control section: 3 to 10 percent

#### C horizons

Hue: 10YR, 7.5YR  
 Value: 4 to 6 dry, 3 to 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: sand, coarse sand

**Riverwash**

Riverwash consists of very deep, excessively drained, stratified sands, gravels, and cobbles from numerous sources. The materials are in the drainageways of this unit, commonly bordered by shallow to steep vertical banks cut into the alluvium. These materials are not stable and are subject to shifting and sorting. Riverwash is usually dry but can be transformed into a temporary watercourse or a short-lived torrent after a heavy rain within the watershed. These materials do not support vegetation.

**8—Borderline fine sandy loam, 2 to 15 percent slopes****Map Unit Setting**

*Landform(s):* fan terraces

*Elevation:* 3,700 to 3,800 feet (1,128 to 1,158 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-2; Chihuahuan-Sonoran Desert Shrub Mix

**Map Unit Composition**

Borderline and similar soils: 70 percent

Minor components: Contention, Monzingo, Ugyp

**Soil Properties and Qualities****Borderline soils**

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Typic Calcigypsis

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*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: 90 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments: 0 percent

*Drainage class:* well drained

*Ksat solum:* 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

*Available water capacity total inches:* 7.6 (high)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* medium

*Hydrologic group:* B

*Ecological site name:* Limy Upland 8-12" p.z.

*Ecological site number:* R041XB208AZ

*Present vegetation:* creosotebush, catclaw acacia, American tarwort, bush muhly, blue threeawn, desert zinnia, dwarf desert peony, littleleaf ratany, low woollygrass, mariola

*Land capability (nonirrigated):* 7c

### Typical Profile

#### *Location*

*Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Arizona, Douglas-Tombstone Part; USGS Quadrangle—Mc Grew Spring; about 2,650 feet east and 1,200 feet south of the northwest corner of section 1, Township 19 south, Range 20 east

*Geographic Coordinate System:* 31° 48' 54.00" north, 110° 15' 22.00" west

A—0 to 2 inches (0 to 5 cm); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4), moist; 12 percent clay; moderate thick platy structure; soft, very friable, nonsticky and slightly plastic; few fine roots; many fine vesicular pores; violently effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bky1—2 to 18 inches (5 to 46 cm); light brown (7.5YR 6/4) loam, brown (7.5YR 5/4), moist; 12 percent clay; weak fine subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; many very fine and fine and few medium roots; common fine irregular and tubular pores; many continuous distinct carbonate coats on rock fragments and on faces of peds; many fine carbonate and gypsum masses; many very fine gypsum crystals on faces of peds; 10 percent gravel; violently effervescent, 28 percent calcium carbonate equivalent and 10 percent gypsum; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bky2—18 to 41 inches (46 to 104 cm); 50 percent light brown (7.5YR 6/4) and 50 percent strong brown (7.5YR 5/6) sandy loam, brown (7.5YR 5/4), moist; 12 percent clay; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many fine and medium tubular pores; many continuous distinct carbonate coats on rock fragments and on faces of peds; many fine carbonate and gypsum masses; many very fine gypsum crystals on faces of peds; 10 percent gravel; violently effervescent, 12 percent calcium carbonate equivalent and 10 percent gypsum; moderately alkaline, pH 8.0; clear smooth boundary.

Bk1—41 to 50 inches (104 to 127 cm); brown (7.5YR 5/3) sandy loam, brown (7.5YR 5/4), moist; 12 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; many fine and medium tubular and irregular pores; very few continuous distinct carbonate coats on rock fragments; 5 percent gravel; violently effervescent, 16 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bk2—50 to 60 inches (127 to 152 cm); brown (7.5YR 5/3) gravelly sandy loam, brown (7.5YR 5/4), moist; 12 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; common fine irregular pores; very few continuous distinct carbonate coats on rock fragments; 25 percent gravel; violently effervescent, 11 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Reaction: 7.4 to 8.4 (slightly or moderately alkaline)

Average percentage of clay in control section: 7 to 18 percent

**A horizon**

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

**Bky horizons**

Hue: 7.5YR, 10YR  
 Value: 5 to 7 dry, 3 to 6 moist  
 Chroma: 4 to 6, dry or moist  
 Texture: loam, sandy loam, fine sandy loam  
 Rock fragments: 0 to 15 percent  
 Calcium carbonate equivalent: 10 to 30 percent  
 Gypsum content: 5 to 10 percent

**Bk horizons**

Hue: 7.5YR, 10YR  
 Value: 5 or 6 dry, 3 to 5 moist  
 Chroma: 3 to 6, dry or moist  
 Texture: sandy loam, loam, fine sandy loam, silt loam  
 Rock fragments: 5 to 30 percent  
 Calcium carbonate equivalent: 10 to 20 percent  
 Gypsum content: 0 to 2 percent

## **9—Brazito loamy sand, Chihuahuan, 0 to 5 percent slopes**

### **Map Unit Setting**

*Landform(s):* alluvial fans  
*Elevation:* 3,400 to 3,800 feet (1,036 to 1,158 meters)  
*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)  
*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)  
*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)  
*Frost-free period:* 190 to 260 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### **Map Unit Composition**

Brazito, Chihuahuan, and similar soils: 95 percent  
 Minor components: Redo, Riverwash

### **Soil Properties and Qualities**

#### **Brazito, Chihuahuan soils**

*Taxonomic classification:* Mixed, thermic Typic Torripsamments  
*Geomorphic position:* inset between terraces and hills  
*Parent material:* mixed sandy alluvium  
*Slope:* 0 to 5 percent  
*Surface cover:*  
 Biological crust  
 Cyanobacteria: 0 percent  
 Lichen: 0 percent

Moss: 0 percent  
 Chemical crust  
   Salt: 0 percent  
   Gypsum: 0 percent  
 Physical cover  
   Canopy plant cover: 65 percent  
   Woody debris: 5 percent  
   Bare soil: 25 percent  
   Rock fragments:  
     • gravel: 15 percent  
*Drainage class:* excessively drained  
*Ksat solum:* 5.95 to 39.69 inches per hour (42.00 to 280.00 micrometers per second)  
*Available water capacity total inches:* 3.6 (low)  
*Shrink-swell potential:* about 1.5 LEP (low)  
*Flooding hazard:* rare  
*Runoff class:* negligible  
*Hydrologic group:* A  
*Ecological site name:* Sandy Loam Upland 8-12" p.z. Deep  
*Ecological site number:* R041XB230AZ  
*Present vegetation:* whitethorn acacia, catclaw acacia, mesquite, bush muhly,  
   perennial forbs, pricklypear, and cholla  
*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 1,350 east and 750 north of the southwest corner of section 27, Township 14 south, Range 20 east  
*Geographic Coordinate System:* 32° 10' 57.10" north, 110° 17' 28.30" west

A—0 to 3 inches (0 to 8 cm); yellowish brown (10YR 5/4) loamy sand, dark yellowish brown (10YR 4/4), moist; 8 percent clay; weak thin and medium platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

C1—3 to 13 inches (8 to 33 cm); yellowish brown (10YR 5/4) loamy sand, dark yellowish brown (10YR 4/4), moist; 5 percent clay; single grain; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

C2—13 to 27 inches (33 to 69 cm); yellowish brown (10YR 5/4) coarse sand, dark yellowish brown (10YR 4/4), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; 5 percent gravel; noneffervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

C3—27 to 60 inches (69 to 152 cm); yellowish brown (10YR 5/4) loamy sand, dark yellowish brown (10YR 4/4), moist; 8 percent clay; massive; soft, very friable, nonsticky and nonplastic; few medium roots; many very fine interstitial pores; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 0 to 15 percent  
 Reaction: 7.4 to 8.4 (slightly to moderately alkaline)  
 Average clay content in the control section: 3 to 10 percent  
 Calcium carbonate equivalent: 0 to 5 percent

**A horizon**

Hue: 7.5YR, 10YR  
 Value: 4 or 5 dry, 3 or 4 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: loamy sand, coarse sand

**C horizons**

Hue: 7.5YR, 10YR  
 Value: 4 to 6 dry, 3 or 4 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: loamy sand, coarse sand

**10—Brazito loamy sand, Sonoran, 0 to 5 percent slopes****Map Unit Setting**

*Landform(s):* alluvial fans  
*Elevation:* 3,400 to 3,800 feet (1,036 to 1,158 meters)  
*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)  
*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)  
*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)  
*Frost-free period:* 190 to 260 days  
*Major Land Resource Area:* 40; Sonoran Basin and Range  
*Land Resource Unit:* 40-1; Upper Sonoran Desert Shrub

**Map Unit Composition**

Brazito, Sonoran, and similar soils: 95 percent  
 Minor components: Redo, Riverwash

**Soil Properties and Qualities****Brazito, Sonoran soils**

*Taxonomic classification:* Mixed, thermic Typic Torripsamments  
*Geomorphic position:* inset between terraces and hills  
*Parent material:* mixed sandy alluvium  
*Slope:* 0 to 5 percent

**Surface cover:**

Biological crust  
 Cyanobacteria: 0 percent  
 Lichen: 0 percent  
 Moss: 0 percent  
 Chemical crust  
 Salt: 0 percent  
 Gypsum: 0 percent  
 Physical cover  
 Canopy plant cover: 65 percent  
 Woody debris: 5 percent  
 Bare soil: 25 percent  
 Rock fragments:  
 • gravel: 15 percent

*Drainage class:* excessively drained

*Ksat solum:* 5.95 to 39.69 inches per hour (42.00 to 280.00 micrometers per second)

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

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* rare

*Runoff class:* negligible

*Hydrologic group:* A

*Ecological site name:* Sandy Loam Upland 10-13" p.z. Deep

*Ecological site number:* R040XA117AZ

*Present vegetation:* whitethorn acacia, catclaw acacia, mesquite, paloverde, bush muhly, perennial forbs, pricklypear, and cholla

*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 1,350 east and 750 north of the southwest corner of section 27, Township 14 south, Range 20 east  
*Geographic Coordinate System:* 32° 10' 57.10" north, 110° 17' 28.30" west

A—0 to 3 inches (0 to 8 cm); yellowish brown (10YR 5/4) loamy sand, dark yellowish brown (10YR 4/4), moist; 8 percent clay; weak thin and medium platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

C1—3 to 13 inches (8 to 33 cm); yellowish brown (10YR 5/4) loamy sand, dark yellowish brown (10YR 4/4), moist; 5 percent clay; single grain; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

C2—13 to 27 inches (33 to 69 cm); yellowish brown (10YR 5/4) coarse sand, dark yellowish brown (10YR 4/4), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; 5 percent gravel; noneffervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

C3—27 to 60 inches (69 to 152 cm); yellowish brown (10YR 5/4) loamy sand, dark yellowish brown (10YR 4/4), moist; 8 percent clay; massive; soft, very friable, nonsticky and nonplastic; few medium roots; many very fine interstitial pores; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 0 to 15 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 3 to 10 percent

Calcium carbonate equivalent: 0 to 5 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: loamy sand, coarse sand

#### C horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: loamy sand, coarse sand

## 11—Brunkcow-Chiricahua-Andrada complex, 3 to 20 percent slopes

### Map Unit Setting

*Landform(s):* hills

*Elevation:* 4,000 to 4,600 feet (1,219 to 1,401 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Brunkcow and similar soils: 35 percent

Chiricahua and similar soils: 25 percent

Andrada and similar soils: 20 percent

Minor components: Rock outcrop, Riverwash, Keysto, Bodecker, Sasabe, Courtland, Diaspar, Andrada soils that have a paralithic contact from 20 to 30 inches

### Soil Properties and Qualities

#### Brunkcow soils

*Taxonomic classification:* Loamy, mixed, superactive, thermic, shallow Ustic Haplargids

*Geomorphic position:* generally on crests and side slopes

*Parent material:* slope alluvium derived from granite and/or diorite

*Slope:* 3 to 20 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 65 percent

Woody debris: 5 percent

Bare soil: 30 percent

Rock fragments:

- gravel: 30 percent

- cobble: 15 percent

*Depth to restrictive feature(s):* 6 to 10 inches to bedrock, paralithic; 8 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 0.06 inches per hour (0.00 to 0.42 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:* Granitic Upland 12-16" p.z.  
*Ecological site number:* R041XC322AZ  
*Present vegetation:* sideoats grama, curly mesquite, hairy grama, slender grama, sprucetop grama, Agave, cane beardgrass, false mesquite, ocotillo, plains lovegrass, tanglehead  
*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* Typical pedon is from the soil survey of Cochise County, Arizona, Douglas-Tombstone Part; USGS Quadrangle—Fairbank; about 2,000 feet south and 2,000 feet west of the northeast corner of section 30, Township 20 south, Range 21 east

*Geographic Coordinate System:* 31° 40' 0.00" north, 110° 14' 20.00" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/4) coarse sandy loam, dark brown (7.5YR 3/4), moist; 10 percent clay; moderate thick platy structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common fine irregular pores; 11 percent gravel and 2 percent cobble; noneffervescent; moderately acid, pH 6.0; abrupt smooth boundary.

Bt—2 to 8 inches (5 to 20 cm); reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4), moist; 28 percent clay; moderate medium subangular blocky structure; soft, friable, moderately sticky and moderately plastic; common very fine and fine roots; common fine irregular and tubular pores; common continuous distinct clay films on faces of peds and between sand grains; 2 percent cobble; noneffervescent; slightly acid, pH 6.2; abrupt wavy boundary.

2Crt—8 to 12 inches (20 to 30 cm); common continuous distinct organic stains and clay films in fractures; weathered granite grus bedrock.

2R—12 to 60 inches (30 to 152 cm); unweathered granite bedrock.

### Range in Characteristics

Rock fragments: 0 to 35 percent

Reaction: 5.6 to 7.3 (moderately acid to neutral)

Average percentage of clay in control section: 18 to 35 percent

#### A horizon

Hue: 10YR, 7.5YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 2 to 4, dry or moist

Texture: coarse sandy loam, sandy loam, loamy coarse sand

#### Bt horizon

Hue: 7.5YR, 5YR

Value: 3 to 5, dry or moist

Chroma: 2 to 4, dry or moist

Texture: sandy loam, sandy clay loam, clay loam

### Chiricahua soils

*Taxonomic classification:* Clayey, mixed, superactive, thermic, shallow Ustic Haplargids

*Geomorphic position:* generally on crests and side slopes

*Parent material:* residuum and/or slope alluvium derived from quartzite

*Slope:* 3 to 20 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 45 percent

Woody debris: 5 percent

Bare soil: 20 percent

Rock fragments:

- gravel: 45 percent

- cobble: 25 percent

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

*Drainage class:* well drained

*Ksat solum:* 0.06 to 5.95 inches per hour (0.42 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:* 2.7 (low)

*Shrink-swell potential:* about 7.5 LEP (high)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* C

*Ecological site name:* Granitic Upland 12-16" p.z.

*Ecological site number:* R041XC322AZ

*Present vegetation:* curly mesquite, hairy grama, sideoats grama, slender grama, sprucetop grama, tobosa, cane beardgrass, desert zinnia, false mesquite, littleleaf ratany, plains lovegrass

*Land capability (nonirrigated):* 6c

## Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—Mescal; about 2,100 feet north and 900 feet west of the southeast corner of section 34, Township 17 south, Range 19 east

*Geographic Coordinate System:* 31° 54' 40.40" north, 110° 23' 11.00" west

A—0 to 2 inches (0 to 5 cm); reddish brown (5YR 4/3) sandy loam, dark reddish brown (5YR 3/3), moist; 16 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and few coarse roots; common very fine interstitial and vesicular pores; noneffervescent; moderately acid, pH 6.0; abrupt smooth boundary.

Bt1—2 to 8 inches (5 to 20 cm); dark reddish brown (2.5YR 3/3) clay, dark reddish brown (2.5YR 3/4), moist; 54 percent clay; strong very fine, fine, and medium subangular blocky structure; slightly hard, friable, very sticky and very plastic; many very fine and few coarse roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; 2 percent gravel; noneffervescent; slightly acid, pH 6.4; abrupt smooth boundary.

Bt2—8 to 13 inches (20 to 33 cm); dark reddish brown (2.5YR 3/3) gravelly clay, dark reddish brown (2.5YR 3/4), moist; 48 percent clay; strong very fine and fine

subangular blocky structure; hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine interstitial pores; many continuous distinct clay films on rock fragments and on faces of peds; 15 percent gravel; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

BCt—13 to 19 inches (33 to 48 cm); 50 percent reddish brown (2.5YR 5/4) and 50 percent reddish brown (2.5YR 4/4) clay, red (2.5YR 4/6), moist; 44 percent clay; strong medium and coarse angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; common very fine and fine roots; few very fine interstitial pores; many continuous distinct clay films on rock fragments and on faces of peds; 3 percent gravel; noneffervescent; neutral, pH 7.0; abrupt wavy boundary.

Crt—19 to 60 inches (48 to 152 cm); many continuous distinct clay films in fractures; weathered quartzite bedrock.

### Range in Characteristics

Rock fragments: 0 to 35 percent

Reaction: 5.6 to 7.3 (moderately acid to neutral)

Average percentage of clay in control section: 35 to 60 percent

A horizon

Hue: 2.5YR, 5YR, 7.5YR

Value: 3 or 4, dry or moist

Chroma: 2 to 4, dry or moist

Texture: clay loam, loam, sandy loam

Bt and BCt horizons

Hue: 2.5YR, 5YR

Value: 3 to 5, dry or moist

Chroma: 2 to 6, dry or moist

Texture: clay, clay loam, sandy clay

### Andrada soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic, shallow Ustic Haplocalcids

*Geomorphic position:* generally on crests and side slopes

*Parent material:* residuum and/or slope alluvium derived from calcareous shale

*Slope:* 3 to 20 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 45 percent

Woody debris: 5 percent

Bare soil: 20 percent

Rock fragments:

- gravel: 55 percent

- cobble: 5 percent

*Depth to restrictive feature(s):* 15 to 20 inches to bedrock, paralithic

*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 to 0.20 inches per hour (0 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:* high

*Hydrologic group:* C

*Ecological site name:* Limy Upland 12-16" p.z.

*Ecological site number:* R041XC309AZ

*Present vegetation:* pricklypear, cholla, ocotillo, black grama, mesquite, whitethorn acacia, false mesquite, sideoats grama, slim tridens

*Land capability (nonirrigated):* 6c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Mescal; about 2,700 feet north and 1,100 feet west of the southeast corner of section 34, Township 17 south, Range 19 east

*Geographic Coordinate System:* 31° 54' 45.40" north, 110° 23' 10.50" west

A—0 to 3 inches (0 to 8 cm); brown (7.5YR 4/2) very gravelly sandy loam, dark brown (7.5YR 3/2), moist; 12 percent clay; weak thin platy parting to weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; common continuous distinct carbonate coats on rock fragments; 45 percent gravel; strongly effervescent, 6 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bk1—3 to 12 inches (8 to 30 cm); brown (7.5YR 4/3) extremely channery sandy loam, dark brown (7.5YR 3/3), moist; 16 percent clay; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 60 percent channer; strongly effervescent, 6 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Bk2—12 to 20 inches (30 to 51 cm); dark gray (10YR 4/1) extremely channery sandy loam, dark brown (10YR 3/3), moist; 14 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 70 percent channer; violently effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

2Crk—20 to 60 inches (51 to 152 cm); many continuous distinct carbonate coats in fractures; weathered shale bedrock.

### Range in Characteristics

Rock fragments: 20 to 80 percent gravel

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 5 to 20 percent

Calcium carbonate equivalent: 5 to 20 percent

#### A horizon

Hue: 10YR, 7.5YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 2 to 4, dry or moist

Texture: sandy loam, fine sandy loam

#### Bk horizons

Hue: 10YR, 7.5YR

Value: 3 to 5, dry or moist

Chroma: 1 to 4, dry or moist

Texture: sandy loam, loam, fine sandy loam

## 12—Budlamp-Rock outcrop complex, 5 to 70 percent slope

### Map Unit Setting

*Landform(s):* mountains

*Elevation:* 4,400 to 6,500 feet (1,341 to 1,981 meters)

*Mean annual precipitation:* 16 to 20 inches (406 to 508 millimeters)

*Mean annual air temperature:* 57 to 62 degrees F (13.9 to 16.7 degrees C)

*Mean annual soil temperature:* 59 to 64 degrees F (15.0 to 17.8 degrees C)

*Frost-free period:* 160 to 210 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-1; Mexican Oak-Pine Woodland and Oak Savannah

### Map Unit Composition

Budlamp and similar soils: 55 percent

Rock outcrop: 25 percent

Minor components: Cherrycow, Magoffin

### Soil Properties and Qualities

#### Budlamp soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Aridic Lithic Haplustolls

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* slope alluvium and/or colluvium derived from granite

*Slope:* 5 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: 40 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

• gravel: 55 percent

• cobble: 25 percent

*Depth to restrictive feature(s):* 5 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 0.01 inches per hour (0.00 to 0.07 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:* Granitic Hills 16-20" p.z.

*Ecological site number:* R041XA102AZ

*Present vegetation:* sideoats grama, sprucetop grama, cane beardgrass, false mesquite, Emory oak, Mexican blue oak, oneseed juniper, ocotillo, tanglehead, mesquite, Schott's yucca, Palmer agave, wolftail, yerba de pasmo

*Land capability (nonirrigated):* 6c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Happy Valley; about 3,200 east and 2,300 feet south of the northeast corner of section 9, Township 15 south, Range 19 east

*Geographic Coordinate System:* 32° 8' 44.00" north, 110° 24' 17.00" west

A1—0 to 2 inches (0 to 5 cm); dark grayish brown (10YR 4/2) very gravelly fine sandy loam, very dark grayish brown (10YR 3/2), moist; 11 percent clay; weak very thin platy parting to very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; 40 percent gravel and 5 percent cobble; noneffervescent; slightly acid, pH 6.4; clear smooth boundary.

A2—2 to 15 inches (5 to 38 cm); dark gray (7.5YR 4/1) very gravelly fine sandy loam, very dark gray (7.5YR 3/1), moist; 11 percent clay; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; many continuous distinct organic stains on rock fragments; 35 percent gravel and 15 percent cobble; noneffervescent; slightly acid, pH 6.2; abrupt wavy boundary.

R—15 to 60 inches (38 to 152 cm); unweathered granite bedrock.

### Range in Characteristics

Rock fragments: 35 to 60 percent

Organic matter: 1 to 3 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average percentage of clay in control section: 5 to 18 percent

#### A horizons

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Texture: sandy loam, fine sandy loam

#### Rock outcrop

Rock outcrop consists of barren rock that occurs as ledges, massive boulder piles, and nearly vertical cliffs of granite. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the summit of mountains.

## 13—Budlamp-Woodcutter-Rock outcrop complex, 15 to 60 percent slopes

### Map Unit Setting

*Landform(s):* mountains

*Elevation:* 4,600 to 6,500 feet (1,402 to 1,981 meters)

*Mean annual precipitation:* 16 to 20 inches (406 to 508 millimeters)

*Mean annual air temperature:* 57 to 62 degrees F (13.9 to 16.7 degrees C)

*Mean annual soil temperature:* 59 to 64 degrees F (15.0 to 17.8 degrees C)

*Frost-free period:* 160 to 210 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-1; Mexican Oak-Pine Woodland and Oak Savannah

### Map Unit Composition

Budlamp and similar soils: 50 percent

Woodcutter and similar soils: 25 percent

Rock outcrop: 20 percent

Minor components: Cherrycow, Kuykendall

### Soil Properties and Qualities

#### Budlamp soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Aridic Lithic Haplustolls

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* slope alluvium derived from quartzite

*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: 60 percent

    Woody debris: 12 percent

    Bare soil: 15 percent

    Rock fragments:

        • gravel: 35 percent

        • cobble: 45 percent

*Depth to restrictive feature(s):* 10 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 0.01 inches per hour (0.00 to 0.07 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:* Granitic Hills 16-20" p.z.

*Ecological site number:* R041XA102AZ

*Present vegetation:* sideoats grama, perennial forbs, plains lovegrass, sacahuista, sotol, annual forbs, annual grasses, ocotillo, Arizona cottontop, cane beardgrass, Palmer agave, green sprangletop, yerba de pasmo

*Land capability (nonirrigated):* 6c

### Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—Dragoon; about 2,800 feet west and 2,000 feet south of the northeast corner of section 27, Township 16 south, Range 22 east

*Geographic Coordinate System:* 32° 1' 1.80" north, 110° 5' 13.50" west

A1—0 to 2 inches (0 to 5 cm); brown (10YR 4/3) very gravelly sandy loam, black (10YR 2/1), moist; 12 percent clay; very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 30 percent gravel and 15 percent cobble; noneffervescent; neutral, pH 7.0; clear smooth boundary.

A2—2 to 12 inches (5 to 30 cm); dark brown (10YR 3/3) very gravelly sandy loam, very dark gray (10YR 3/1), moist; 12 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common medium roots; many very fine interstitial pores; 30 percent gravel and 15 percent cobble; noneffervescent; neutral, pH 7.2; abrupt wavy boundary.

R—12 to 60 inches (30 to 152 cm); unweathered quartzite bedrock.

### Range in Characteristics

Rock fragments: 35 to 60 percent

Organic matter: 1 to 3 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average percentage of clay in control section: 5 to 18 percent

A horizons

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Texture: sandy loam, loam, fine sandy loam

### Woodcutter soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Aridic Lithic Argiustolls

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* slope alluvium derived from quartzite

*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: 40 percent

Woody debris: 12 percent

Bare soil: 15 percent

Rock fragments:

- gravel: 35 percent

- cobble: 45 percent

*Depth to restrictive feature(s):* 10 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 0.01 inches per hour (0.00 to 0.07 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

*Hydrologic group:* D

*Ecological site name:* Granitic Hills 16-20" p.z.

*Ecological site number:* R041XA102AZ

*Present vegetation:* sideoats grama, perennial forbs, plains lovegrass, sacahuista, sotol, annual forbs, annual grasses, ocotillo, Arizona cottontop, cane beardgrass, Palmer agave, green sprangletop, yerba de pasmo

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Dagoon; about 2,500 feet west and 2,300 feet south of the northeast corner of section 27, Township 16 south, Range 22 east

*Geographic Coordinate System:* 32° 1' 3.70" north, 110° 5' 3.30" west

A—0 to 3 inches (0 to 8 cm); brown (7.5YR 4/3) very gravelly sandy loam, dark brown (7.5YR 3/2), moist; 12 percent clay; weak very fine and fine granular structure; soft, very friable, moderately sticky and moderately plastic; many very fine roots; many very fine interstitial pores; 40 percent gravel and 10 percent cobble; noneffervescent; neutral, pH 7.0; abrupt smooth boundary.

Bt—3 to 13 inches (8 to 33 cm); dark reddish brown (5YR 3/3) very gravelly sandy clay loam, dark reddish brown (5YR 3/3), moist; 32 percent clay; moderate very fine and fine subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; many very fine roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; 40 percent gravel and 10 percent cobble; noneffervescent; neutral, pH 6.8; abrupt wavy boundary.

R—13 to 60 inches (33 to 152 cm); unweathered quartzite bedrock.

### Range in Characteristics

Rock fragments: 35 to 60 percent

Organic matter: 1 to 2 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average percentage of clay in control section: 20 to 35 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 2 or 3, dry or moist

Texture: sandy loam, loam, fine sandy loam

#### Bt horizon

Hue: 5YR, 7.5YR

Value: 3 or 4 dry or moist

Chroma: 2 or 3, dry or moist

Texture: clay loam, sandy clay loam, loam

### Rock outcrop

Rock outcrop consists of barren rock that occurs as ledges, massive boulder piles, and nearly vertical cliffs of quartzite. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the summit of mountains.

## 14—Calcigypsids-Contention-Redo complex, Chihuahuan, 5 to 45 percent slopes

### Map Unit Setting

*Landform(s):* Calcigypsids and Contention – dissected relict lakebeds; Redo – fan terraces

*Elevation:* 3,500 to 4,100 feet (1,067 to 1,250 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### Map Unit Composition

Calcigypsids, Chihuahuan, and similar soils: 40 percent

Contention, Chihuahuan, and similar soils: 26 percent

Redo, Chihuahuan, and similar soils: 25 percent

Minor components: Pinaleno, Monzingo, Whitlock

### Soil Properties and Qualities

#### Calcigypsids, Chihuahuan soils

*Taxonomic classification:* Calcigypsids

*Geomorphic position:* generally on side slopes

*Parent material:* calcareous and gypsiferous lacustrine deposits

*Slope:* 5 to 45 percent

*Surface cover:*

Biological crust

    Cyanobacteria: 0 percent

    Lichen: 0 percent

    Moss: 0 percent

Chemical crust

    Salt: 0 percent

    Gypsum: 15 percent

Physical cover

    Canopy plant cover: 25 percent

    Woody debris: 5 percent

    Bare soil: 15 percent

    Rock fragments:

        • gravel: 25 percent

        • cobble: 15 percent

*Drainage class:* well drained

*Ksat solum:* 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

*Available water capacity total inches:* 6.6 (moderate)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Gypsum Upland 8-12" p.z.

*Ecological site number:* R041XB219AZ

*Present vegetation:* creosotebush, whitethorn acacia, desert zinnia, mesquite, Texas dogweed, bush muhly, desert holly, burroweed, tarbush

*Land capability (nonirrigated):* 8

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 1,850 feet east and 2,700 feet south of the northwest corner of section 23, Township 16 south, Range 20 east

*Geographic Coordinate System:* 32° 1' 1.00" north, 110° 16' 27.50" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 5/4), moist; 12 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine irregular and many very fine vesicular pores; strongly effervescent, 6 percent calcium carbonate equivalent and 3 percent gypsum; moderately alkaline, pH 8.0; clear smooth boundary.

Bk—2 to 11 inches (5 to 28 cm); light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4), moist; 12 percent clay; weak very fine subangular blocky parting to weak fine granular structure; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots; many very fine irregular pores; few continuous distinct carbonate coats on rock fragments; common fine carbonate masses; 3 percent gravel; strongly effervescent, 8 percent calcium carbonate equivalent and 3 percent gypsum; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bky1—11 to 42 inches (28 to 107 cm); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4), moist; 12 percent clay; moderate very fine and fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; many very fine and fine tubular pores; common fine gypsum crystals; many fine gypsum and carbonate masses; 3 percent gravel; violently effervescent, 8 percent calcium carbonate equivalent and 7 percent gypsum; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bky2—42 to 60 inches (107 to 152 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 12 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few very fine roots; many very fine and fine irregular and tubular pores; common continuous distinct carbonate coats on rock fragments; common fine gypsum and carbonate masses; 5 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent and 7 percent gypsum; moderately alkaline, pH 8.2.

### Range in Characteristics

Reaction: 7.9 to 8.4 (moderately alkaline)

Average clay content in the control section: 7 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Gypsum content: 3 to 10 percent

#### A horizon

Hue: 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: loam, fine sandy loam, sandy loam

**B horizons**

Hue: 7.5YR, 5YR

Value: 4 to 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

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

**Contention, Chihuahuan soils***Taxonomic classification:* Fine, smectitic, thermic Typic Gypsite*Geomorphic position:* generally on side slopes*Parent material:* calcareous and/or gypsiferous lacustrine deposits*Slope:* 5 to 45 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: 10 percent

Woody debris: 0 percent

Bare soil: 0 percent

Rock fragments:

• gravel: 80 percent

• cobble: 10 percent

*Drainage class:* well drained*Ksat solum:* 0.00 to 5.95 inches per hour (0.01 to 42.00 micrometers per second)*Available water capacity total inches:* 6.5 (moderate)*Shrink-swell potential:* about 10.0 LEP (very high)*Flooding hazard:* none*Runoff class:* very high*Hydrologic group:* D*Ecological site name:* Gypsum Upland 8-12" p.z.*Ecological site number:* R041XB219AZ*Present vegetation:* whitethorn acacia, creosotebush, bush muhly, desert zinnia, mesquite, mariola, desert holly, tobosa, burroweed, alkali sacaton, black grama, tarbush*Land capability (nonirrigated):* 7c**Typical Profile***Location**Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 1,800 feet east and 2,200 feet south of the northwest corner of section 23, Township 16 south, Range 20 east*Geographic Coordinate System:* 32° 1' 16.20" north, 110° 16' 28.00" west

A1—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; weak thin platy parting to weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine irregular pores; strongly effervescent, 3 percent calcium carbonate equivalent and 3 percent gypsum; moderately alkaline, pH 8.0; clear smooth boundary.

A2—2 to 9 inches (5 to 23 cm); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR

4/4), moist; 11 percent clay; weak very fine subangular blocky parting to weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine irregular pores; common fine gypsum and carbonate masses; strongly effervescent, 4 percent calcium carbonate equivalent and 8 percent gypsum; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bky1—9 to 19 inches (23 to 48 cm); light brown (7.5YR 6/4) clay, brown (7.5YR 5/4), moist; 50 percent clay; strong medium and coarse prismatic and moderate very coarse prismatic parting to moderate fine and medium angular blocky structure; very hard, firm, very sticky and very plastic; many very fine and fine roots; common very fine tubular pores; many continuous distinct organic stains on faces of peds; common fine gypsum and carbonate masses; strongly effervescent, 6 percent calcium carbonate equivalent and 12 percent gypsum; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bky2—19 to 60 inches (48 to 152 cm); light brown (7.5YR 6/4) clay, brown (7.5YR 5/4), moist; 45 percent clay; strong coarse and very coarse prismatic parting to moderate coarse and very coarse angular blocky structure; extremely hard, firm, very sticky and very plastic; many very fine and fine roots; common very fine interstitial and tubular pores; many fine carbonate and gypsum masses; many fine gypsum crystals; many continuous distinct organic stains on faces of peds: common distinct iron-manganese masses on faces of peds; strongly effervescent, 10 percent calcium carbonate equivalent and 12 percent gypsum; moderately alkaline, pH 8.2.

### Range in Characteristics

Soil cracking: many vertical cracks 0.25 inch to 2 inches wide and from the surface to a depth of 30 inches

Reaction: 7.9 to 8.4 (moderately alkaline)

Average clay content in the control section: 35 to 60 percent

Calcium carbonate equivalent: 1 to 10 percent

Gypsum content: 1 to 15 percent

#### A horizon

Hue: 7.5YR, 5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

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

#### B horizons

Hue: 7.5YR, 5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: clay

### Redo, Chihuahuan soils

*Taxonomic classification:* Sandy-skeletal, mixed, thermic Typic Haplocalcids

*Geomorphic position:* shoulders

*Parent material:* mixed calcareous fan alluvium

*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: 50 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

- gravel: 25 percent
- cobble: 15 percent

*Drainage class:* excessively drained

*Ksat solum:* 1.98 to 39.69 inches per hour (14.00 to 280.00 micrometers per second)

*Available water capacity total inches:* 3.1 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* very low

*Hydrologic group:* A

*Ecological site name:* Limy Slopes 8-12" p.z.

*Ecological site number:* R041XB207AZ

*Present vegetation:* creosotebush, mesquite, whitethorn acacia, desert zinnia, desert holly, bush muhly, snakeweed, tarbush, burroweed, threeawn

*Land capability (nonirrigated):* 7c

## Typical Profile

**Location**

*Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 200 feet east and 1,100 feet north of the southwest corner of section 24, Township 16 south, Range 20 east

*Geographic Coordinate System:* 32° 1' 1.60" north, 110° 15' 51.20" west

A—0 to 1 inch (0 to 3 cm); yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4), moist; 10 percent clay; weak medium and thick platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and tubular pores; common continuous distinct carbonate coats on rock fragments; 3 percent gravel; slightly effervescent, 1 percent calcium carbonate equivalent; slightly alkaline, pH 7.8.

Bk1—1 to 10 inches (3 to 25 cm); yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4), moist; 10 percent clay; weak fine subangular blocky parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine tubular and interstitial pores; common continuous distinct carbonate coats on rock fragments; many fine carbonate masses; 5 percent gravel; strongly effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

Bk2—10 to 21 inches (25 to 53 cm); yellowish brown (10YR 5/4) very gravelly coarse sand, dark yellowish brown (10YR 4/4), moist; 4 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine irregular pores; many continuous distinct carbonate coats on bottom surfaces of rock fragments; 30 percent gravel and 10 percent cobble; slightly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

Bk3—21 to 41 inches (53 to 104 cm); 50 percent very pale brown (10YR 7/3) and 50 percent light yellowish brown (10YR 6/4) very cobbly coarse sand, brown (10YR 5/3), moist; 2 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; many very fine irregular pores; many continuous distinct carbonate coats on bottom surfaces of rock fragments; 20 percent gravel and 25 percent cobble; slightly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

Bk4—41 to 60 inches (104 to 152 cm); 50 percent light yellowish brown (10YR 6/4) and 50 percent very pale brown (10YR 7/3) gravelly coarse sand, brown (10YR 5/3), moist; 2 percent clay; single grain; loose, nonsticky and nonplastic; few very fine roots; many very fine irregular pores; many continuous distinct carbonate coats on bottom surfaces of rock fragments; 20 percent gravel; slightly effervescent, 1 percent calcium carbonate equivalent; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 5 to 50 percent, averages more than 35 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 3 to 8 percent

#### A horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, loamy sand

Calcium carbonate equivalent: 1 to 10 percent

#### B horizons

Hue: 7.5YR, 10YR

Value: 5 to 7 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: coarse sand, loamy sand, sand, loamy coarse sand, sandy loam

Calcium carbonate equivalent: 5 to 10 percent

## 15—Calcigypsids-Contention-Redo complex, Sonoran, 5 to 45 percent slopes

### Map Unit Setting

*Landform(s):* Calcigypsids and Contention – relict lakebeds; Redo – fan terraces

*Elevation:* 3,500 to 4,100 feet (1,067 to 1,250 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 40; Sonoran Basin and Range

*Land Resource Unit:* 40-1; Upper Sonoran Desert Shrub

### Map Unit Composition

Calcigypsids, Sonoran, and similar soils: 40 percent

Contention, Sonoran, and similar soils: 26 percent

Redo, Sonoran, and similar soils: 25 percent

Minor components: Pinaleno, Monzingo, Whitlock

### Soil Properties and Qualities

#### Calcigypsids, Sonoran soils

*Taxonomic classification:* Calcigypsids

*Geomorphic position:* generally on side slopes

*Parent material:* calcareous and gypsiferous lacustrine deposits

*Slope:* 5 to 45 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 15 percent

Physical cover

Canopy plant cover: 25 percent

Woody debris: 5 percent

Bare soil: 15 percent

Rock fragments:

• gravel: 25 percent

• cobble: 15 percent

*Drainage class:* well drained*Ksat solum:* 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)*Available water capacity total inches:* 6.6 (moderate)*Shrink-swell potential:* about 1.5 LEP (low)*Flooding hazard:* none*Runoff class:* high*Hydrologic group:* B*Ecological site name:* Gypsum Upland 10-13" p.z.*Ecological site number:* R040XA126AZ*Present vegetation:* creosotebush, whitethorn acacia, desert zinnia, mesquite, Texas dogweed, bush muhly, desert holly, burroweed, tarbush*Land capability (nonirrigated):* 8**Typical Profile***Location**Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 1,850 feet east and 2,700 feet south of the northwest corner of section 23, Township 16 south, Range 20 east*Geographic Coordinate System:* 32° 1' 1.00" north, 110° 16' 27.50" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 5/4), moist; 12 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine irregular and many very fine vesicular pores; strongly effervescent, 6 percent calcium carbonate equivalent and 3 percent gypsum; moderately alkaline, pH 8.0; clear smooth boundary.

Bk—2 to 11 inches (5 to 28 cm); light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4), moist; 12 percent clay; weak very fine subangular blocky parting to weak fine granular structure; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots; many very fine irregular pores; few continuous distinct carbonate coats on rock fragments; common fine carbonate masses; 3 percent gravel; strongly effervescent, 8 percent calcium carbonate equivalent and 3 percent gypsum; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bky1—11 to 42 inches (28 to 107 cm); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4), moist; 12 percent clay; moderate very fine and fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many very fine and

fine tubular pores; common fine gypsum crystals; many fine gypsum and carbonate masses; 3 percent gravel; violently effervescent, 8 percent calcium carbonate equivalent and 7 percent gypsum; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bky2—42 to 60 inches (107 to 152 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 12 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few very fine roots; many very fine and fine irregular and tubular pores; common continuous distinct carbonate coats on rock fragments; common fine gypsum and carbonate masses; 5 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent and 7 percent gypsum; moderately alkaline, pH 8.2.

### Range in Characteristics

Reaction: 7.9 to 8.4 (moderately alkaline)

Average clay content in the control section: 7 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Gypsum content: 3 to 10 percent

#### A horizon

Hue: 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: loam, fine sandy loam, sandy loam

#### B horizons

Hue: 7.5YR, 5YR

Value: 4 to 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

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

### Contention, Sonoran soils

*Taxonomic classification:* Fine, smectitic, thermic Typic Gypsite

*Geomorphic position:* generally on side slopes

*Parent material:* calcareous and/or gypsiferous lacustrine deposits

*Slope:* 5 to 45 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: 10 percent

Woody debris: 0 percent

Bare soil: 0 percent

Rock fragments:

- gravel: 80 percent

- cobble: 10 percent

*Drainage class:* well drained

*Ksat solum:* 0.00 to 5.95 inches per hour (0.01 to 42.00 micrometers per second)

*Available water capacity total inches:* 6.5 (moderate)

*Shrink-swell potential:* about 10.0 LEP (very high)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Gypsum Upland 10-13" p.z.

*Ecological site number:* R040XA126AZ

*Present vegetation:* whitethorn, creosotebush, bush muhly, desert zinnia, mesquite, mariola, desert holly, tobosa, burroweed, alkali sacaton, black grama, tarbush

*Land capability (nonirrigated):* 7c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 1,800 feet east and 2,200 feet south of the northwest corner of section 23, Township 16 south, Range 20 east

*Geographic Coordinate System:* 32° 1' 16.20" north, 110° 16' 28.00" west

A1—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; weak thin platy parting to weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine irregular pores; strongly effervescent, 3 percent calcium carbonate equivalent and 3 percent gypsum; moderately alkaline, pH 8.0; clear smooth boundary.

A2—2 to 9 inches (5 to 23 cm); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; weak very fine subangular blocky parting to weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine irregular pores; common fine gypsum and carbonate masses; strongly effervescent, 4 percent calcium carbonate equivalent and 8 percent gypsum; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bky1—9 to 19 inches (23 to 48 cm); light brown (7.5YR 6/4) clay, brown (7.5YR 5/4), moist; 50 percent clay; strong medium and coarse prismatic and moderate very coarse prismatic parting to moderate fine and medium angular blocky structure; very hard, firm, very sticky and very plastic; many very fine and fine roots; common very fine tubular pores; many continuous distinct organic stains on faces of peds; common fine gypsum and carbonate masses; strongly effervescent, 6 percent calcium carbonate equivalent and 12 percent gypsum; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bky2—19 to 60 inches (48 to 152 cm); light brown (7.5YR 6/4) clay, brown (7.5YR 5/4), moist; 45 percent clay; strong coarse and very coarse prismatic parting to moderate coarse and very coarse angular blocky structure; extremely hard, firm, very sticky and very plastic; many very fine and fine roots; common very fine interstitial and tubular pores; many fine carbonate and gypsum masses; many fine gypsum crystals; many continuous distinct organic stains on faces of peds; common distinct iron-manganese masses on faces of peds; strongly effervescent, 10 percent calcium carbonate equivalent and 12 percent gypsum; moderately alkaline, pH 8.2.

### Range in Characteristics

Soil cracking: many vertical cracks 0.25 inch to 2 inches wide and from the surface to a depth of 30 inches

Reaction: 7.9 to 8.4 (moderately alkaline)

Average clay content in the control section: 35 to 60 percent

Calcium carbonate equivalent: 1 to 10 percent

Gypsum content: 1 to 15 percent

A horizon

Hue: 7.5YR, 5YR

Value: 4 to 6 dry, 3 to 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: loam, clay loam, sandy loam, fine sandy loam

#### B horizons

Hue: 7.5YR, 5YR  
 Value: 4 to 6 dry, 3 to 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: clay

#### **Redo, Sonoran soils**

*Taxonomic classification:* Sandy-skeletal, mixed, thermic Typic Haplocalcids

*Geomorphic position:* shoulders

*Parent material:* mixed calcareous fan alluvium

*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: 50 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

- gravel: 25 percent
- cobble: 15 percent

*Drainage class:* excessively drained

*Ksat solum:* 1.98 to 39.69 inches per hour (14.00 to 280.00 micrometers per second)

*Available water capacity total inches:* 3.1 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* very low

*Hydrologic group:* A

*Ecological site name:* Limy Slopes 10-13" p.z.

*Ecological site number:* R040XA110AZ

*Present vegetation:* creosotebush, mesquite, whitethorn acacia, desert zinnia, desert holly, bush muhly, snakeweed, tarbush, burroweed, threeawn

*Land capability (nonirrigated):* 7c

### **Typical Profile**

#### *Location*

*Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 200 feet east and 1,100 feet north of the southwest corner of section 24, Township 16 south, Range 20 east

*Geographic Coordinate System:* 32° 1' 1.60" north, 110° 15' 51.20" west

A—0 to 1 inch (0 to 3 cm); yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4), moist; 10 percent clay; weak medium and thick platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and tubular pores; common continuous distinct carbonate coats on rock fragments; 3 percent gravel; slightly effervescent, 1 percent calcium carbonate equivalent; slightly alkaline, pH 7.8.

Bk1—1 to 10 inches (3 to 25 cm); yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4), moist; 10 percent clay; weak fine subangular blocky parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine tubular and interstitial pores; common continuous distinct carbonate coats on rock fragments; many fine carbonate masses; 5 percent gravel; strongly effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

Bk2—10 to 21 inches (25 to 53 cm); yellowish brown (10YR 5/4) very gravelly coarse sand, dark yellowish brown (10YR 4/4), moist; 4 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine irregular pores; many continuous distinct carbonate coats on bottom surfaces of rock fragments; 30 percent gravel and 10 percent cobble; slightly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

Bk3—21 to 41 inches (53 to 104 cm); 50 percent very pale brown (10YR 7/3) and 50 percent light yellowish brown (10YR 6/4) very cobbly coarse sand, brown (10YR 5/3), moist; 2 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; many very fine irregular pores; many continuous distinct carbonate coats on bottom surfaces of rock fragments; 20 percent gravel and 25 percent cobble; slightly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

Bk4—41 to 60 inches (104 to 152 cm); 50 percent light yellowish brown (10YR 6/4) and 50 percent very pale brown (10YR 7/3) gravelly coarse sand, brown (10YR 5/3), moist; 2 percent clay; single grain; loose, nonsticky and nonplastic; few very fine roots; many very fine irregular pores; many continuous distinct carbonate coats on bottom surfaces of rock fragments; 20 percent gravel; slightly effervescent, 1 percent calcium carbonate equivalent; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 5 to 50 percent, averages more than 35 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 3 to 8 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, loamy sand

Calcium carbonate equivalent: 1 to 10 percent

#### B horizons

Hue: 7.5YR, 10YR

Value: 5 to 7 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: coarse sand, loamy sand, sand, loamy coarse sand, sandy loam

Calcium carbonate equivalent: 5 to 10 percent

## 16—Carbine-Hathaway complex, 3 to 15 percent slopes

### Map Unit Setting

*Landform(s)*: fan terraces

*Elevation*: 4,400 to 6,200 feet (1,341 to 1,890 meters)

*Mean annual precipitation*: 16 to 20 inches (406 to 508 millimeters)

*Mean annual air temperature:* 57 to 62 degrees F (13.9 to 16.7 degrees C)

*Mean annual soil temperature:* 59 to 64 degrees F (15.0 to 17.8 degrees C)

*Frost-free period:* 160 to 210 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-1; Mexican Oak-Pinyon Woodland and Oak Savannah

### Map Unit Composition

Carbine and similar soils: 65 percent

Hathaway and similar soils: 25 percent

Minor components: Murray, Cazador, Blacktail

### Soil Properties and Qualities

#### Carbine soils

*Taxonomic classification:* Loamy, mixed, superactive, thermic, shallow Petrocalcic Calciustolls

*Geomorphic position:* shoulder

*Parent material:* mixed calcareous fan alluvium

*Slope:* 3 to 15 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 40 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

- gravel: 55 percent

- cobble: 25 percent

*Depth to restrictive feature(s):* 5 to 20 inches to petrocalcic

*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:* 1.7 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* D

*Ecological site name:* Limy Upland 16-20" p.z.

*Ecological site number:* R041XA105AZ

*Present vegetation:* false mesquite, slim tridens, black grama, littleleaf sumac, sacahuista, blue threeawn, banana yucca, Hall's panic, sotol, Palmer agave, hairy grama, poverty threeawn

*Land capability (nonirrigated):* 6c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—Steele Hills; about 650 feet north and 300 feet west of the southeast corner of section 10, Township 15 south, Range 22 east  
*Geographic Coordinate System:* 32° 8' 24.30" north, 110° 4' 54.10" west

A—0 to 1 inch (0 to 3 cm); brown (7.5YR 4/2) gravelly fine sandy loam, dark brown (7.5YR 3/2), moist; 10 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 20 percent gravel and 10 percent cobble; strongly effervescent, 15 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Bk1—1 to 7 inches (3 to 18 cm); brown (7.5YR 4/2) gravelly loam, dark brown (7.5YR 3/2), moist; 10 percent clay; weak very fine subangular blocky and granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine and fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 20 percent gravel and 10 percent cobble; violently effervescent, 30 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bk2—7 to 14 inches (18 to 36 cm); brown (7.5YR 5/3) cobbly loam, dark brown (7.5YR 3/3), moist; 10 percent clay; moderate very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine interstitial and tubular pores; many continuous distinct carbonate coats on rock fragments; 10 percent gravel and 15 percent cobble; violently effervescent, 25 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bkm—14 to 60 inches (36 to 152 cm); cemented material, indurated, 0.25 to 0.5 inch thick laminar cap; cemented by calcium carbonates and silica.

## Range in Characteristics

Rock fragments: 5 to 35 percent

Organic matter: 1 to 3 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 5 to 18 percent

### A horizon

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Texture: fine sandy loam, sandy loam

Calcium carbonate equivalent: 3 to 15 percent

### Bk horizons

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Texture: loam, fine sandy loam, sandy loam

Calcium carbonate equivalent: 15 to 40 percent

**Bkm horizon**

Cemented: calcium carbonate  
 Hardness: very strongly cemented to indurated  
 Thickness: 1 foot to 5 feet

When mapped in association with Cherrycow soils, these soils are underlain by welded tuff.

**Hathaway soils**

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Aridic

Calciustolls

*Geomorphic position:* side slopes

*Parent material:* mixed calcareous fan alluvium

*Slope:* 3 to 15 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 40 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

- gravel: 65 percent

- cobble: 15 percent

*Drainage class:* well drained

*Ksat solum:* 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

*Available water capacity total inches:* 2.6 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* medium

*Hydrologic group:* B

*Ecological site name:* Limy Slopes 16-20" p.z.

*Ecological site number:* R041XA104AZ

*Present vegetation:* false mesquite, black grama, sacahuista, blue threeawn, slim tridens, littleleaf sumac, Palmer agave, banana yucca, sumac, sideoats grama, snakeweed

*Land capability (nonirrigated):* 6c

**Typical Profile***Location*

*Public Land Survey:* USGS Quadrangle—Steele Hills; about 200 feet north and 200 feet west of the southeast corner of section 11, Township 15 south, Range 22 east

*Geographic Coordinate System:* 32° 8' 20.70" north, 110° 4' 48.90" west

A—0 to 4 inches (0 to 10 cm); brown (7.5YR 4/3) very gravelly fine sandy loam, dark brown (7.5YR 3/3), moist; 10 percent clay; weak thin platy parting to moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; many very fine and fine and few medium roots; many very fine irregular pores; many continuous distinct carbonate coats on rock fragments; 40 percent gravel and 10 percent cobble; strongly

effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk1—4 to 14 inches (10 to 35 cm); brown (7.5YR 4/3) extremely gravelly sandy loam, dark brown (7.5YR 3/3), moist; 10 percent clay; moderate very fine and fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; many very fine irregular pores; many continuous distinct carbonate coats on rock fragments; 60 percent gravel and 10 percent cobble; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk2—14 to 30 inches (35 to 76 cm); brown (7.5YR 4/4) extremely gravelly sandy loam, dark brown (7.5YR 3/4), moist; 10 percent clay; moderate very fine and fine subangular blocky parting to weak very fine granular structure; soft, very friable, slightly sticky and nonplastic; many very fine and fine and few medium roots; many very fine tubular and irregular pores; many continuous distinct carbonate coats on rock fragments; 60 percent gravel; violently effervescent, 21 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bk3—30 to 60 inches (76 to 152 cm); brown (7.5YR 4/4) extremely gravelly sandy loam, dark brown (7.5YR 3/4), moist; 10 percent clay; massive; loose, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 60 percent gravel and 15 percent cobble; violently effervescent, 36 percent calcium carbonate equivalent; slightly alkaline, pH 7.8.

#### Range in Characteristics

Rock fragments: 35 to 75 percent

Organic matter: 1 to 3 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 5 to 18 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Texture: fine sandy loam, sandy loam, loam

Calcium carbonate equivalent: 1 to 15 percent

#### Bk horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 1 to 4, dry or moist

Texture: loam, fine sandy loam, sandy loam

Calcium carbonate equivalent: 15 to 40 percent

When mapped in association with Cherrycow soils, these soils are underlain by welded tuff.

## 17—Cascabel, Quiburi soils, and Riverwash, Chihuahuan, 0 to 5 percent slopes

#### Map Unit Setting

*Landform(s)*: flood plains

*Elevation:* 2,900 to 3,600 feet (884 to 1,098 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### **Stream Segment Properties and Qualities**

Segment length: Located in San Pedro River corridor. Beginning 1 mile south of Teran Wash, continuing south for 2 miles to Palomas Wash. Beginning 5 miles south from Palomas Wash, continuing south for 17 miles. Beginning at the southern boundary of the soil survey area and continuing north for 1 mile to the Pomerene Diversion Dam.

Active flood plain width: 50 to 200 feet

Stream flow: intermittent

Flooding hazard: very frequent; long; 7 to 30 days

Flood month: July-September and January-March

Seasonal water table minimum depth: 0 to 60 inches

Water table kind: apparent

Water table present: year round

Bank entrenchment:

Percent cut: 90

Percent uncut: 10

Average vertical cut: 5 to 50 feet; averages 6 to 8 feet

Depositional bar features: dynamic system of interbraided bars and channels that relocate with each major flood event; height varies with the depth and velocity of flood water

Meander pattern: irregular

Channel composition:

Bedrock percent: 0 to 5

Cobbles percent: 5 to 10

Gravel percent: 40 to 50

Sand percent: 30 to 40

Silt and clay percent: 20 to 30

Stability: a dynamic system of interbraided components that are generally degrading and aggrading

### **Map Unit Composition**

This is an undifferentiated map unit. These components are not consistently associated geographically. At least one component is present in every delineation, but each delineation can have any combination of the components. This map unit is not consistent over time. The components of this map unit consist of a dynamic, interbraided system of bars and channels. The active stream dynamics of the San Pedro River cause these components to shift locations. The stream channel meanders across the floodplain, degrading and scouring, leaving behind Riverwash. The channel also aggrades and revegetates, producing Quiburi or Cascabel, depending on velocity of the deposited sediments. This map unit does not have permanent surface water, but can have surface water from 20 to 30 days.

Minor components: Typic Fluvaquents, Gila, Vinton, Glendale, and soils containing greater than 35 percent rock fragments, fine-silty textured soils

## Soil Properties and Qualities

### Cascabel, Chihuahuan soils

*Taxonomic classification:* Sandy, mixed, thermic Oxyaquic Torrfluvents

*Geomorphic position:* dynamic system of interbraided bars and channels

*Parent material:* mixed stream alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 90 percent

Woody debris: 5 percent

Bare soil: 5 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)

*Available water capacity total inches:* 5.2 (moderate)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* frequent

*Seasonal water table minimum depth:* about 24 to 79 inches

*Runoff class:* very low

*Hydrologic group:* A

*Ecological site name:* Populus fremontii-Salix gooddingii/Sporobolus wrightii

*Ecological site number:* F041XB218AZ

*Present vegetation:* saltcedar tamarisk, Bermuda grass, seepwillow baccharis, giant sacaton, Fremont cottonwood, Goodding willow, annual grasses, feather fingergrass, fourwing saltbush, needle grama, spike dropseed

*Land capability (nonirrigated):* 7c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—Benson; about 1,750 feet west and 1,100 north of the southeast corner of section 14, Township 17 south, Range 20 east

*Geographic Coordinate System:* 31° 57' 11.00" north, 110° 16' 18.00" west

C1—0 to 2 inches (0 to 5 cm); light brown (7.5YR 6/3) fine sand, brown (7.5YR 5/3), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; strongly effervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

C2—2 to 5 inches (5 to 13 cm); brown (7.5YR 5/3) fine sandy loam, brown (7.5YR 4/3), moist; 11 percent clay; weak very fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C3—5 to 8 inches (13 to 20 cm); light brown (7.5YR 6/3) very fine sandy loam, brown (7.5YR 5/3), moist; 11 percent clay; massive; soft, very friable, nonsticky and

nonplastic; many very fine roots; many very fine tubular pores; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C4—8 to 45 inches (20 to 114 cm); light brown (7.5YR 6/3) loamy fine sand, brown (7.5YR 5/3), moist; 5 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and few medium roots; many very fine interstitial pores; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C5—45 to 50 inches (114 to 127 cm); brown (7.5YR 5/3) silt loam, brown (7.5YR 4/3), moist; 11 percent clay; weak very fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and few medium roots; many very fine interstitial pores; many iron depletions infused into matrix along faces of peds and iron-manganese masses; violently effervescent; moderately alkaline, pH 8.2.

### Range in Characteristics

Rock fragments: 0 to 10 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 5 to 15 percent

#### C horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4 dry, 2 to 4 moist

Texture: coarse sand, sand, fine sand, loamy fine sand, fine sandy loam, with thin strata of silt loam, silty clay loam, very fine sandy loam

Redoximorphic features: few to many redox concentrations occurring as iron masses (7.5YR 5/8, 7.5YR 6/6) and linings along root channels and few to many redox depletions

#### Quiburi, Chihuahuan soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, calcareous, thermic Oxyaquic Torrifluvents

*Geomorphic position:* dynamic system of interbraided bars and channels

*Parent material:* mixed stream alluvium

*Slope:* 0 to 5 percent

#### *Surface cover:*

##### Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

##### Chemical crust

Salt: 0 percent

Gypsum: 0 percent

##### Physical cover

Canopy plant cover: 90 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments: 0 percent

*Drainage class:* moderately well drained

*Ksat solum:* 0.57 to 39.69 inches per hour (4.00 to 280.00 micrometers per second)

*Available water capacity total inches:* 11.3 (very high)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* frequent

*Seasonal water table minimum depth:* about 24 to 79 inches

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Populus fremontii-Salix gooddingii/Sporobolus wrightii

*Ecological site number:* F041XB218AZ

*Present vegetation:* saltcedar tamarisk, Bermuda grass, seepwillow baccharis, giant sacaton, Fremont cottonwood, Goodding willow, annual grasses, feather fingergrass, fourwing saltbush, needle grama, spike dropseed

*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Benson; about 1,400 feet north and 1,400 feet west of the southeast corner of section 14, Township 17 south, Range 20 east

*Geographic Coordinate System:* 31° 57' 11.00" north, 110° 16' 15.00" west

C1—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) very fine sandy loam, brown (7.5YR 4/3), moist; 8 percent clay; weak fine granular structure; loose, nonsticky and nonplastic; many very fine and fine roots; many very fine interstitial pores; violently effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

C2—2 to 10 inches (5 to 25 cm); brown (7.5YR 5/3) silt loam, brown (7.5YR 4/3), moist; 11 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine tubular pores; violently effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C3—10 to 19 inches (25 to 48 cm); 50 percent brown (7.5YR 4/4) and 50 percent brown (7.5YR 5/3) silt loam, brown (7.5YR 4/3), moist; 21 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; many very fine and fine and common medium roots; many very fine and fine tubular pores; violently effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C4—19 to 27 inches (48 to 69 cm); 50 percent brown (7.5YR 5/3) and 50 percent brown (7.5YR 4/4) silt loam, brown (7.5YR 4/3), moist; 11 percent clay; weak very fine and fine angular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; many very fine and fine tubular pores; common distinct redox depletions on faces of peds; common distinct redox concentrations occurring as soft fine iron masses on surfaces along pores; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C5—27 to 45 inches (69 to 114 cm); brown (7.5YR 5/3) silt loam, brown (7.5YR 4/3), moist; 11 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine and fine tubular pores; common distinct redox depletions on faces of peds; common distinct redox concentrations occurring as soft fine strong brown (7.5YR) iron masses on surfaces along pores and root channels; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

2C—45 to 60 inches (114 to 152 cm); brown (7.5YR 5/3) coarse sand, brown (7.5YR 4/3), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine and few medium roots; many fine interstitial pores; violently effervescent; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 0 to 10 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 5 to 18 percent

**C horizons**

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4 dry, 2 to 4 moist

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

Redoximorphic features: few to many redox concentrations occurring as iron masses (7.5YR 5/8, 7.5YR 6/6) and linings along root channels and none to common redox depletions (5BG 5/1, 5B 3/1, 5B 3/1, 5B 2.5/1, N/0); usually occur in strata finer than loamy fine sand

**Riverwash, Chihuahuan**

Riverwash consists of very deep, excessively drained, stratified sands, gravel, and cobbles from numerous sources. This material is part of a dynamic, interbraided system of bars and channels, commonly bordered by shallow to steep vertical cutbanks into the alluvium. This material is not stable and is subject to shifting and sorting. Riverwash is usually dry but can be transformed into a temporary watercourse or a short-lived torrent after a heavy rain within the watershed. This material does not support vegetation.

**18—Cascabel, Quiburi soils, and Riverwash, Sonoran, 0 to 5 percent slopes****Map Unit Setting**

*Landform(s):* flood plains

*Elevation:* 2,900 to 3,600 feet (884 to 1,098 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 40; Sonoran Basin and Range

*Land Resource Unit:* 40-1; Upper Sonoran Desert Shrub

**Stream Segment Properties and Qualities**

Segment length: Located in San Pedro River corridor. South of confluence of Paige Canyon and Hookers Hot Springs and continuing 5 miles south to Teran Wash.

Active flood plain width: 50 to 200 feet

Stream flow: intermittent

Flooding hazard: very frequent; long; 7 to 30 days

Flood month: July-September and January-March

Seasonal water table minimum depth: 0 to 60 inches

Water table kind: apparent

Water table present: year round

Bank entrenchment:

Percent cut: 90

Percent uncut: 10

Average vertical cut: 5 to 50 feet; averages 6 to 8 feet

Depositional bar features: dynamic system of interbraided bars and channels that relocate with each major flood event; height varies with the depth and velocity of flood water

Meander pattern: irregular meander

Channel composition:

Bedrock percent: 0 to 5  
 Cobbles percent: 5 to 10  
 Gravel percent: 40 to 50  
 Sand percent: 30 to 40  
 Silt and clay percent: 20 to 30

Stability: a dynamic system of interbraided components that are generally degrading and aggrading

### Map Unit Composition

This is an undifferentiated map unit. These components are not consistently associated geographically. At least one component is present in every delineation, but each delineation can have any combination of the components. This map unit is not consistent over time. The components of this map unit consist of a dynamic, interbraided system of bars and channels. The active stream dynamics of the San Pedro River cause these components to shift locations. The stream channel meanders across the floodplain, degrading and scouring, leaving behind Riverwash. The channel also aggrades and revegetates, producing Quiburi or Cascabel, depending on the velocity of the deposited sediments. This map unit does not have permanent surface water, but can have surface water from 20 to 30 days.

Minor components: Typic Fluvaquents, Gila, Vinton, Glendale, and soils containing greater than 35 percent rock fragments, fine-silty textured soils

### Soil Properties and Qualities

#### Cascabel, Sonoran soils

*Taxonomic classification:* Sandy, mixed, thermic Oxyaquic Torrifuvents

*Geomorphic position:* dynamic system of interbraided bars and channels

*Parent material:* mixed stream alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 90 percent

Woody debris: 5 percent

Bare soil: 5 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)

*Available water capacity total inches:* 5.2 (moderate)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* frequent

*Seasonal water table minimum depth:* about 24 to 79 inches

*Runoff class:* very low

*Hydrologic group:* A

*Ecological site name:* Populus fremontii-Salix gooddingii/Sporobolus wrightii

*Ecological site number:* F040XA125AZ

*Present vegetation:* saltcedar tamarisk, Bermuda grass, seepwillow baccharis, giant

sacaton, Fremont cottonwood, Goodding willow, annual grasses, feather fingergrass, fourwing saltbush, needle grama, spike dropseed  
*Land capability (nonirrigated): 7c*

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Benson; about 1,750 feet west and 1,100 north of the southeast corner of section 14, Township 17 south, Range 20 east  
*Geographic Coordinate System:* 31° 57' 11.00" north, 110° 16' 18.00" west

C1—0 to 2 inches (0 to 5 cm); light brown (7.5YR 6/3) fine sand, brown (7.5YR 5/3), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; strongly effervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

C2—2 to 5 inches (5 to 13 cm); brown (7.5YR 5/3) fine sandy loam, brown (7.5YR 4/3), moist; 11 percent clay; weak very fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C3—5 to 8 inches (13 to 20 cm); light brown (7.5YR 6/3) very fine sandy loam, brown (7.5YR 5/3), moist; 11 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C4—8 to 45 inches (20 to 114 cm); light brown (7.5YR 6/3) loamy fine sand, brown (7.5YR 5/3), moist; 5 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and few medium roots; many very fine interstitial pores; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C5—45 to 50 inches (114 to 127 cm); brown (7.5YR 5/3) silt loam, brown (7.5YR 4/3), moist; 11 percent clay; weak very fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and few medium roots; many very fine interstitial pores; many iron depletions infused into matrix along faces of peds and iron-manganese masses; violently effervescent; moderately alkaline, pH 8.2.

### Range in Characteristics

Rock fragments: 0 to 10 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 5 to 15 percent

#### C horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4 dry, 2 to 4 moist

Texture: coarse sand, sand, fine sand, loamy fine sand, fine sandy loam, with thin strata of silt loam, silty clay loam, very fine sandy loam

Redoximorphic features: few to many redox concentrations occurring as iron masses (7.5YR 5/8, 7.5YR 6/6) and linings along root channels and few to many redox depletions

#### **Quiburi, Sonoran soils**

*Taxonomic classification:* Coarse-loamy, mixed, superactive, calcareous, thermic Oxyaquic Torrifluents

*Geomorphic position:* dynamic system of interbraided bars and channels

*Parent material:* mixed stream alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

- Biological crust
  - Cyanobacteria: 0 percent
  - Lichen: 0 percent
  - Moss: 0 percent
- Chemical crust
  - Salt: 0 percent
  - Gypsum: 0 percent
- Physical cover
  - Canopy plant cover: 90 percent
  - Woody debris: 5 percent
  - Bare soil: 5 percent
  - Rock fragments: 0 percent

*Drainage class:* moderately well drained

*Ksat solum:* 0.57 to 39.69 inches per hour (4.00 to 280.00 micrometers per second)

*Available water capacity total inches:* 11.3 (very high)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* frequent

*Seasonal water table minimum depth:* about 24 to 79 inches

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* *Populus fremontii*-*Salix gooddingii*/*Sporobolus wrightii*

*Ecological site number:* F040XA125AZ

*Present vegetation:* saltcedar tamarisk, Bermuda grass, seepwillow baccharis, giant sacaton, Fremont cottonwood, Goodding willow, annual grasses, feather fingergrass, fourwing saltbush, needle grama, spike dropseed

*Land capability (nonirrigated):* 7c

## Typical Profile

### *Location*

*Public Land Survey:* USGS Quadrangle—Benson; about 1,400 feet north and 1,400 feet west of the southeast corner of section 14, Township 17 south, Range 20 east

*Geographic Coordinate System:* 31° 57' 11.00" north, 110° 16' 15.00" west

C1—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) very fine sandy loam, brown (7.5YR 4/3), moist; 8 percent clay; weak fine granular structure; loose, nonsticky and nonplastic; many very fine and fine roots; many very fine interstitial pores; violently effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

C2—2 to 10 inches (5 to 25 cm); brown (7.5YR 5/3) silt loam, brown (7.5YR 4/3), moist; 11 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine tubular pores; violently effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C3—10 to 19 inches (25 to 48 cm); 50 percent brown (7.5YR 4/4) and 50 percent brown (7.5YR 5/3) silt loam, brown (7.5YR 4/3), moist; 21 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; many very fine and fine and common medium roots; many very fine and fine tubular pores; violently effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C4—19 to 27 inches (48 to 69 cm); 50 percent brown (7.5YR 5/3) and 50 percent brown (7.5YR 4/4) silt loam, brown (7.5YR 4/3), moist; 11 percent clay; weak very fine and fine angular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; many very fine and fine tubular

pores; common distinct redox depletions on faces of peds; common distinct redox concentrations occurring as soft fine iron masses on surfaces along pores; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C5—27 to 45 inches (69 to 114 cm); brown (7.5YR 5/3) silt loam, brown (7.5YR 4/3), moist; 11 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine and fine tubular pores; common distinct redox depletions on faces of peds; common distinct redox concentrations occurring as soft fine strong brown (7.5YR) iron masses on surfaces along root channels; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

2C—45 to 60 inches (114 to 152 cm); brown (7.5YR 5/3) coarse sand, brown (7.5YR 4/3), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine and few medium roots; many fine interstitial pores; violently effervescent; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 0 to 10 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 5 to 18 percent

#### C horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4 dry, 2 to 4 moist

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

Redoximorphic features: few to many redox concentrations occurring as iron masses (7.5YR 5/8, 7.5YR 6/6) and linings along root channels and none to common redox depletions (5BG 5/1, 5B 3/1, 5B 3/1, 5B 2.5/1, N/0); usually occur in strata finer than loamy fine sand

#### Riverwash, Sonoran

Riverwash consists of very deep, excessively drained, stratified sands, gravel, and cobbles from numerous sources. This material is part of a dynamic interbraided system of bars and channels, commonly bordered by shallow to steep vertical cutbanks into the alluvium. This material is not stable and is subject to shifting and sorting. Riverwash is usually dry but can be transformed into a temporary watercourse or a short-lived torrent after a heavy rain within the watershed. It does not support vegetation because of the constant scouring and shifting it undergoes.

## 19—Cascabel, Quiburi, and Typic Fluvaquents soils and Water, Chihuahuan, 0 to 5 percent slopes

### Map Unit Setting

*Landform(s):* flood plains

*Elevation:* 2,900 to 3,600 feet (884 to 1,098 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-2; Chihuahuan-Sonoran Desert Shrub Mix

**Stream Segment Properties and Qualities**

Segment length: Located in San Pedro River corridor. Starting at Teran Wash south for 1 mile, then continuing south of Palomas Wash for 5 miles.

Active flood plain width: 50 to 100 feet

Stream flow: perennial to intermittent

Flooding hazard: very frequent; long; 7 to 30 days

Flood month: July-September and January-March

Seasonal water table minimum depth: 0 to 15 inches

Water table kind: apparent

Water table present: year round

Bank entrenchment:

Percent cut: 90

Percent uncut: 10

Average vertical cut: 5 to 50 feet; averages 6 to 8 feet

Depositional bar features: dynamic system of interbraided bars and channels that relocate with each major flood event; height varies with the depth and velocity of flood water

Meander pattern: irregular meander

Channel composition:

Bedrock percent: 0 to 5

Cobbles percent: 5 to 10

Gravel percent: 40 to 50

Sand percent: 30 to 40

Silt and clay percent: 20 to 30

Stability: a dynamic system of interbraided components that are generally degrading and aggrading.

**Map Unit Composition**

This is an undifferentiated map unit. These components are not consistently associated geographically. At least one component is present in every delineation, but each delineation can have any combination of the components. This map unit is not consistent over time. The components of this map unit consist of a dynamic, interbraided system of bars and channels. The active stream dynamics of the San Pedro River cause these components to shift locations. The stream channel meanders across the floodplain, degrading and scouring, leaving behind Riverwash. The channel also aggrades and revegetates, producing Quiburi or Cascabel soils, depending on the velocity of the deposited sediments. This map unit has permanent surface water.

Minor components: Gila, Vinton, Glendale, and soils containing greater than 35 percent rock fragments, fine-silty textured soils

**Soil Properties and Qualities****Cascabel, Chihuahuan soils**

*Taxonomic classification:* Sandy, mixed, thermic Oxyaquic Torrfluvents

*Geomorphic position:* dynamic system of interbraided bars and channels

*Parent material:* mixed stream alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

**Chemical crust**

Salt: 0 percent

Gypsum: 0 percent

**Physical cover**

Canopy plant cover: 90 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments: 0 percent

*Drainage class:* moderately well drained*Ksat solum:* 0.57 to 39.69 inches per hour (4.00 to 280.00 micrometers per second)*Available water capacity total inches:* 5.0 (low)*Shrink-swell potential:* about 1.5 LEP (low)*Flooding hazard:* frequent*Seasonal water table minimum depth:* about 24 to 79 inches*Runoff class:* very low*Hydrologic group:* A*Ecological site name:* Populus fremontii-Salix gooddingii/Sporobolus wrightii*Ecological site number:* F041XB218AZ*Present vegetation:* Bermuda grass, seepwillow baccharis, Fremont cottonwood, Goodding willow, feather fingergrass, giant sacaton, annual grasses, fourwing saltbush, needle grama, saltcedar tamarisk, spike dropseed*Land capability (nonirrigated):* 7c**Typical Profile***Location**Public Land Survey:* USGS Quadrangle—Wildhorse; about 750 feet south and 80 feet east of the northwest corner of section 3, Township 15 south, Range 20 east*Geographic Coordinate System:* 32° 9' 49.00" north, 110° 17' 44.00" west

C1—0 to 7 inches (0 to 18 cm); pale brown (10YR 6/3) fine sand, brown (10YR 5/3), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine roots; common very fine irregular pores; violently effervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

C2—7 to 9 inches (18 to 23 cm); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4), moist; 15 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; common fine tubular pores; violently effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C3—9 to 18 inches (23 to 46 cm); light brown (7.5YR 6/3) sand, brown (7.5YR 5/3), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine and few very coarse roots; common fine irregular pores; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C4—18 to 78 inches (46 to 198 cm); pale brown (10YR 6/3) sand, brown (10YR 5/3), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; few very fine and common fine roots; common fine irregular pores; strongly effervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Cg—78 to 84 inches (198 to 213 cm); light brown (7.5YR 6/3) coarse sand, brown (10YR 5/3) and dark yellowish brown (10YR 4/4), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; few very fine roots; many fine irregular pores; few redox concentrations occurring as fine iron masses in the matrix; slightly effervescent; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 0 to 15 percent  
 Reaction: 7.4 to 8.4 (slightly to moderately alkaline)  
 Average clay content in the control section: 1 to 10 percent

#### C1 and C2 horizons

Hue: 7.5YR, 10YR  
 Value: 4 to 6 dry, 3 to 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: silt loam, fine sand, loamy fine sand, coarse sand, fine sandy loam

#### C horizons

Hue: 7.5YR, 10YR  
 Value: 4 to 6 dry, 3 to 5 moist  
 Chroma: 3 or 4 dry, 2 to 4 moist  
 Texture: coarse sand, sand, fine sand, loamy fine sand with thin strata of silt loam, silty clay loam, very fine sandy loam, loam  
 Redoximorphic features: few to many redox concentrations occurring as iron masses (7.5YR 5/8, 7.5YR6/6) and linings along root channels and none to common redox depletions (5BG 5/1, 5BG 3/1, 5B 3/1, 5B 2.5/1); usually occur in strata finer than loamy fine sand

### Quiburi, Chihuahuan soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, calcareous, thermic Oxyaquic Torrifluvents

*Geomorphic position:* dynamic system of interbraided bars and channels

*Parent material:* mixed stream alluvium

*Slope:* 0 to 5 percent

#### *Surface cover:*

##### Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

##### Chemical crust

Salt: 0 percent

Gypsum: 0 percent

##### Physical cover

Canopy plant cover: 90 percent

Woody debris: 5 percent

Bare soil: 5 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)

*Available water capacity total inches:* 9.1 (high)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* frequent

*Seasonal water table minimum depth:* about 24 to 79 inches

*Runoff class:* very low

*Hydrologic group:* B

*Ecological site name:* Populus fremontii-Salix gooddingii/Sporobolus wrightii

*Ecological site number:* F041XB218AZ

*Present vegetation:* seepwillow baccharis, Bermuda grass, Fremont cottonwood, Goodding willow, feather fingergrass, annual grasses, fourwing saltbush, giant sacaton, needle grama, saltcedar tamarisk, spike dropseed

*Land capability (nonirrigated):* 7c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 750 feet south and 50 feet east of the northwest corner of section 3, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 9' 49.00" north, 110° 17' 44.00" west

C1—0 to 4 inches (0 to 10 cm); brown (7.5YR 5/4) loam, brown (7.5YR 4/3), moist; 15 percent clay; weak thin platy structure parting to single grain; soft, very friable, moderately sticky and moderately plastic; many very fine and fine roots; many very fine and fine tubular pores; strongly effervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

C2—4 to 15 inches (10 to 38 cm); light brown (7.5YR 6/3) fine sandy loam, brown (7.5YR 5/4), moist; 11 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots; common very fine and fine tubular pores; few faint redox concentrations occurring as soft fine reddish yellow (7.5YR 6/8), moist, iron masses on faces of peds and on surfaces along root channels; strongly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

C3—15 to 25 inches (38 to 64 cm); pale brown (10YR 6/3) loam, brown (10YR 5/3), moist; 15 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; many very fine and fine tubular pores; common faint redox concentrations occurring as soft fine reddish yellow (7.5YR 6/8), moist, iron masses on faces of peds and on surfaces along root channels; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C4—25 to 32 inches (64 to 81 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; many fine tubular pores; common faint redox concentrations occurring as soft fine reddish yellow (7.5YR 6/8), moist, iron masses on faces of peds and on surfaces along root channels; strongly effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

C5—32 to 45 inches (81 to 114 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine and few medium tubular pores; common faint redox concentrations occurring as soft fine strong brown (7.5YR 5/6), moist, iron masses on faces of peds and on surfaces along root channels; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C6—45 to 67 inches (114 to 170 cm); pale brown (10YR 6/3) fine sand, brown (10YR 5/3), moist; 3 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common fine roots; many fine irregular pores; common faint redox concentrations occurring as soft fine strong brown (7.5YR 5/6), moist, iron masses on faces of peds and on surfaces along root channels; slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C7—67 to 80 inches (170 to 203 cm); pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3), moist; 11 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine roots; many very fine and fine tubular pores; common faint redox concentrations occurring as soft fine yellowish red (5YR 5/6) and strong brown (7.5YR 5/6), moist, iron masses on faces of peds and on surfaces along root channels; strongly effervescent; moderately alkaline, pH 8.2.

### Range in Characteristics

Rock fragments: 0 to 10 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 7 to 18 percent

C1 and C2 horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4 dry or moist

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

C horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4 dry, 2 to 4 moist

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

Redoximorphic features: few to many redox concentrations occurring as iron masses (7.5YR 5/8, 7.5YR 6/6), (7.5YR 5/6), (7.5YR 6/8) and linings along root channels and none to common redox depletions (5BG 5/1, 5BG 3/1, 5B 3/1, 5B 2.5/1); usually occur in strata finer than loamy fine sand

### Typic Fluvaquents, Chihuahuan soils

*Taxonomic classification:* Typic Fluvaquents

*Geomorphic position:* stream banks of water channel

*Parent material:* mixed stream alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 90 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments: 0 percent

*Drainage class:* poorly drained

*Ksat solum:* 1.98 to 39.69 inches per hour (14.00 to 280.00 micrometers per second)

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

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* very frequent

*Seasonal water table minimum depth:* about 0 to 15 inches

*Runoff class:* medium

*Hydrologic group:* D

*Ecological site name:* Populus fremontii-Salix gooddingii/Sporobolus wrightii

*Ecological site number:* F041XB218AZ

*Present vegetation:* Bermuda grass, seepwillow baccharis, Goodding willow, Fremont cottonwood, annual grasses, feather fingergrass, giant sacaton, needle grama, spike dropseed

*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 700 feet south and 100 feet east of the northwest corner of section 3, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 9' 49.00" north, 110° 17' 44.00" west

Cg1—0 to 5 inches (0 to 13 cm); 20 percent gray (N 5/0) and 80 percent light brown (7.5YR 6/3) sandy loam, 20 percent dark gray (N 4/0) reduced and 80 percent brown (7.5YR 5/3), moist; 10 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine interstitial pores; few iron depletions on surfaces along root channels; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Cg2—5 to 19 inches (13 to 48 cm); 50 percent bluish gray (5B 5/1) and 50 percent light brown (7.5YR 6/3) coarse sand, 50 percent dark bluish gray (5B 4/1) reduced and 50 percent bluish black (10B 2.5/1) reduced, moist; 5 percent clay; single grain; loose, nonsticky and nonplastic; many fine roots; many very fine interstitial pores; few iron depletions on surfaces along root channels; 5 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Cg3—19 to 30 inches (48 to 76 cm); 50 percent bluish gray (5B 5/1) and 50 percent light brown (7.5YR 6/3) gravelly coarse sand, 50 percent dark bluish gray (5B 4/1) and 50 percent dark bluish gray (5B 3/1), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; common iron depletions on surfaces along root channels; 15 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Cg4—30 to 40 inches (76 to 101 cm) gravelly coarse sand and water; 1 percent clay; loose, nonsticky and nonplastic; 15 percent gravel; strongly effervescent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 0 to 20 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 1 to 12 percent

#### C horizons

Hue: 7.5YR, 10B, 5B, 5BG,N

Value: 3 to 6 dry, 2 to 5 moist

Chroma: 0 to 3, dry or moist

Texture: coarse sand, sandy loam, fine sand, sand

#### Water

*Width:* 1 foot to 20 feet

*Depth:* 1 inch to 36 inches

## 20—Cascabel, Quiburi, and Typic Fluvaquents soils and Water, Sonoran, 0 to 5 percent slopes

### Map Unit Setting

*Landform(s):* flood plains

*Elevation:* 2,900 to 3,600 feet (884 to 1,098 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 40; Sonoran Basin and Range

*Land Resource Unit:* 40-1; Upper Sonoran Desert Shrub

### Stream Segment Properties and Qualities

Segment length: Located in San Pedro River corridor. Starting about 1 mile south of the boundary of the Eastern Pima and Northwestern Cochise county lines, and continuing south for 6 miles to the confluence of Paige Canyon and Hookers Hot Springs Canyon.

Active flood plain width: 50 to 100 feet

Stream flow: perennial to intermittent

Flooding hazard: very frequent; long; 7 to 30 days

Flood month: July-September and January-March

Seasonal water table minimum depth: 0 to 15 inches

Water table kind: apparent

Water table present: year round

Bank entrenchment:

Percent cut: 90

Percent uncut: 10

Average vertical cut: 5 to 50 feet; averages 6 to 8 feet

Depositional bar features: dynamic system of interbraided bars and channels that relocate with each major flood event; height varies with the depth and velocity of flood water

Meander pattern: irregular meander

Channel composition:

Bedrock percent: 0 to 5

Cobbles percent: 5 to 10

Gravel percent: 40 to 50

Sand percent: 30 to 40

Silt and clay percent: 20 to 30

Stability: a dynamic system of interbraided components that are generally degrading and aggrading

### Map Unit Composition

This is an undifferentiated map unit. These components are not consistently associated geographically. At least one component is present in every delineation, but each delineation can have any combination of the components. This map unit is not consistent over time. It is made up of a dynamic, interbraided system of bars and channels which shift locations as the active stream dynamics of the San Pedro River change. The stream channel meanders across the floodplain, degrading and scouring, leaving behind Riverwash. The channel also agrades and revegetates,

producing Quiburi or Cascabel soils, depending on the velocity of the deposited sediments. This map unit has permanent surface water.

Minor components: Gila, Vinton, Glendale, and soils containing greater than 35 percent rock fragments, and fine-silty textured soils

### Soil Properties and Qualities

#### Cascabel, Sonoran soils

*Taxonomic classification:* Sandy, mixed, thermic Oxyaquic Torrfluvents

*Geomorphic position:* dynamic system of interbraided bars and channels

*Parent material:* mixed stream alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 90 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments: 0 percent

*Drainage class:* moderately well drained

*Ksat solum:* 1.98 to 39.69 inches per hour (14.00 to 280.00 micrometers per second)

*Available water capacity total inches:* 5.0 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* frequent

*Seasonal water table minimum depth:* about 24 to 79 inches

*Runoff class:* very low

*Hydrologic group:* A

*Ecological site name:* Populus fremontii-Salix gooddingii/Sporobolus wrightii

*Ecological site number:* F040XA125AZ

*Present vegetation:* Bermuda grass, seepwillow baccharis, Fremont cottonwood, Goodding willow, feather fingergrass, giant sacaton, annual grasses, fourwing saltbush, needle grama, saltcedar tamarisk, spike dropseed

*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse; about 750 feet south and 80 feet east of the northwest corner of section 3, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 9' 49.00" north, 110° 17' 44.00" west

C1—0 to 7 inches (0 to 18 cm); pale brown (10YR 6/3) fine sand, brown (10YR 5/3), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine roots; common very fine irregular pores; violently effervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

C2—7 to 9 inches (18 to 23 cm); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4), moist; 15 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; common fine tubular pores; violently effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C3—9 to 18 inches (23 to 46 cm); light brown (7.5YR 6/3) sand, brown (7.5YR 5/3), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine and few very coarse roots; common fine irregular pores; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C4—18 to 78 inches (46 to 198 cm); pale brown (10YR 6/3) sand, brown (10YR 5/3), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; few very fine and common fine roots; common fine irregular pores; strongly effervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

2Cg5—78 to 84 inches (198 to 213 cm); light brown (7.5YR 6/3) coarse sand, brown (10YR 5/3) and dark yellowish brown (10YR 4/4), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; few very fine roots; many fine irregular pores; few faint redox concentrations occurring as fine iron masses in the matrix; slightly effervescent; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 0 to 15 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 1 to 10 percent

#### C1 and C2 horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

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

#### C horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4 dry, 2 to 4 moist

Texture: coarse sand, sand, fine sand, loamy fine sand with thin strata of silt loam, silty clay loam, very fine sandy loam, loam

Redoximorphic features: few to many redox concentrations occurring as iron masses (7.5YR 5/8, 7.5YR6/6) and linings along root channels and none to common redox depletions (5BG 5/1, 5BG 3/1, 5B 3/1, 5B 2.5/1); usually occur in strata finer than loamy fine sand

### Quiburi, Sonoran soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, calcareous, thermic Oxyaquic Torrifluvents

*Geomorphic position:* dynamic system of interbraided bars and channels

*Parent material:* mixed stream alluvium

*Slope:* 0 to 5 percent

#### *Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 90 percent

Woody debris: 5 percent

Bare soil: 5 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)

*Available water capacity total inches:* 9.1 (high)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* frequent

*Seasonal water table minimum depth:* about 24 to 79 inches

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Populus fremontii-Salix gooddingii/Sporobolus wrightii

*Ecological site number:* F040XA125AZ

*Present vegetation:* seepwillow baccharis, Bermuda grass, Fremont cottonwood, Goodding willow, feather fingergrass, annual grasses, fourwing saltbush, giant sacaton, needle grama, saltcedar tamarisk, spike dropseed

*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 750 feet south and 50 feet east of the northwest corner of section 3, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 9' 49.00" north, 110° 17' 44.00" west

C1—0 to 4 inches (0 to 10 cm); brown (7.5YR 5/4) loam, brown (7.5YR 4/3), moist; 15 percent clay; weak thin platy structure parting to single grain; soft, very friable, moderately sticky and moderately plastic; many very fine and fine roots; many very fine and fine tubular pores; strongly effervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

C2—4 to 15 inches (10 to 38 cm); light brown (7.5YR 6/3) fine sandy loam, brown (7.5YR 5/4), moist; 11 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots; common very fine and fine tubular pores; few faint redox concentrations occurring as soft fine reddish yellow (7.5YR 6/8), moist, iron masses on faces of peds and on surfaces along root channels; strongly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

C3—15 to 25 inches (38 to 64 cm); pale brown (10YR 6/3) loam, brown (10YR 5/3), moist; 15 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; many very fine and fine tubular pores; common faint redox concentrations occurring as soft fine reddish yellow (7.5YR 6/8), moist, iron masses on faces of peds and on surfaces along root channels; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C4—25 to 32 inches (64 to 81 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; many fine tubular pores; common faint redox concentrations occurring as soft fine reddish yellow (7.5YR 6/8), moist, iron masses on faces of peds and on surfaces along root channels; strongly effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

C5—32 to 45 inches (81 to 114 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine and few medium tubular pores; common faint redox concentrations occurring as soft fine strong brown

(7.5YR 5/6), moist, iron masses on faces of peds and on surfaces along root channels; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C6—45 to 67 inches (114 to 170 cm); pale brown (10YR 6/3) fine sand, brown (10YR 5/3), moist; 3 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common fine roots; many fine irregular pores; common faint redox concentrations occurring as soft fine strong brown (7.5YR 5/6), moist, iron masses on faces of peds and on surfaces along root channels; slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C7—67 to 80 inches (170 to 203 cm); pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3), moist; 11 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine roots; many very fine and fine tubular pores; common faint redox concentrations occurring as soft fine yellowish red (5YR5/6) and strong brown (7.5YR 5/6), moist, iron masses on faces of peds and on surfaces along root channels; strongly effervescent; moderately alkaline, pH 8.2.

### Range in Characteristics

Rock fragments: 0 to 10 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 7 to 18 percent

C1 and C2 horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4 dry or moist

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

C horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4 dry, 2 to 4 moist

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

Redoximorphic features: few to many redox concentrations occurring as iron masses (7.5YR 5/8, 7.5YR 6/6), (7.5YR 5/6), (7.5YR 6/8) and linings along root channels and none to common redox depletions (5BG 5/1, 5BG 3/1, 5B 3/1, 5B 2.5/1); usually occur in strata finer than loamy fine sand

### Typic Fluvaquents, Sonoran soils

*Taxonomic classification:* Typic Fluvaquents

*Geomorphic position:* stream banks of water channel

*Parent material:* mixed stream alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 90 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments: 0 percent

*Drainage class:* poorly drained  
*Ksat solum:* 1.98 to 39.69 inches per hour (14.00 to 280.00 micrometers per second)  
*Available water capacity total inches:* 2.0 (very low)  
*Shrink-swell potential:* about 1.5 LEP (low)  
*Flooding hazard:* very frequent  
*Seasonal water table minimum depth:* about 0 to 15 inches  
*Runoff class:* negligible  
*Hydrologic group:* D  
*Ecological site name:* Populus fremontii-Salix gooddingii/Sporobolus wrightii  
*Ecological site number:* F040XA125AZ  
*Present vegetation:* Bermuda grass, seepwillow baccharis, Goodding willow, Fremont cottonwood, annual grasses, feather fingergrass, giant sacaton, needle grama, spike dropseed  
*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 700 feet south and 100 feet east of the northwest corner of section 3, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 9' 49.00" north, 110° 17' 44.00" west

Cg1—0 to 5 inches (0 to 13 cm); 20 percent gray (N 5/0) and 80 percent light brown (7.5YR 6/3) sandy loam, 20 percent dark gray (N 4/0) reduced and 80 percent brown (7.5YR 5/3), moist; 10 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine interstitial pores; few iron depletions on surfaces along root channels; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Cg2—5 to 19 inches (13 to 48 cm); 50 percent bluish gray (5B 5/1) and 50 percent light brown (7.5YR 6/3) coarse sand, 50 percent dark bluish gray (5B 4/1) reduced and 50 percent bluish black (10B 2.5/1) reduced, moist; 5 percent clay; single grain; loose, nonsticky and nonplastic; many fine roots; many very fine interstitial pores; few iron depletions on surfaces along root channels; 5 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Cg3—19 to 30 inches (48 to 76 cm); 50 percent bluish gray (5B 5/1) and 50 percent light brown (7.5YR 6/3) gravelly coarse sand, 50 percent dark bluish gray (5B 4/1) and 50 percent dark bluish gray (5B 3/1), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; common iron depletions on surfaces along root channels; 15 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Cg4—30 to 40 inches (76 to 101 cm) gravelly coarse sand and water; 1 percent clay; loose, nonsticky and nonplastic; 15 percent gravel; strongly effervescent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 0 to 20 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 1 to 12 percent

#### C horizons

Hue: 7.5YR, 10B, 5B, 5BG, N

Value: 3 to 6 dry, 2 to 5 moist

Chroma: 0 to 3, dry or moist

Texture: coarse sand, sandy loam, fine sand, sand

**Water***Width:* 1 to 20 feet*Depth:* 1 to 36 inches**21—Cazador silty clay loam, 0 to 5 percent slopes****Map Unit Setting***Landform(s):* alluvial fans*Elevation:* 4,400 to 5,600 feet (1,341 to 1,707 meters)*Mean annual precipitation:* 16 to 20 inches (406 to 508 millimeters)*Mean annual air temperature:* 57 to 62 degrees F (13.9 to 16.7 degrees C)*Mean annual soil temperature:* 59 to 64 degrees F (15.0 to 17.8 degrees C)*Frost-free period:* 160 to 210 days*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range*Land Resource Unit:* 41-1; Mexican Oak-Pine Woodland and Oak Savannah**Map Unit Composition**

Cazador and similar soils: 70 percent

Minor components: Carbine

**Soil Properties and Qualities****Cazador soils***Taxonomic classification:* Fine, smectitic, thermic Torrertic Haplustolls*Geomorphic position:* inset between terraces and hills*Parent material:* mixed calcareous fan alluvium*Slope:* 0 to 5 percent*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 60 percent

Woody debris: 5 percent

Bare soil: 40 percent

Rock fragments:

- gravel: 10 percent

*Drainage class:* well drained*Ksat solum:* 0.00 to 0.57 inches per hour (0.01 to 4.00 micrometers per second)*Available water capacity total inches:* 9.1 (high)*Shrink-swell potential:* about 10.0 LEP (very high)*Flooding hazard:* rare*Runoff class:* medium*Hydrologic group:* D*Ecological site name:* Clayey Upland 16-20" p.z.*Ecological site number:* R041XA126AZ*Present vegetation:* tobosa, burrograss, broom snakeweed, mesquite, soaptree yucca, sacahuista*Land capability (nonirrigated):* 6c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—Steele Hills; about 650 feet north and 1,850 feet west of the southeast corner of section 2, Township 15 south, Range 22 east  
*Geographic Coordinate System:* 32° 9' 11.00" north, 110° 4' 8.00" west

A—0 to 3 inches (0 to 8 cm); brown (7.5YR 5/3) silty clay loam, very dark brown (7.5YR 2.5/2), moist; 32 percent clay; weak thin platy parting to weak very fine and fine subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; few very fine roots; common very fine vesicular pores; strongly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

B—3 to 27 inches (8 to 69 cm); brown (7.5YR 4/2) clay, very dark brown (7.5YR 2.5/2), moist; 50 percent clay; moderate very fine and fine subangular and angular blocky structure; very hard, firm, very sticky and very plastic; common very fine and few medium roots; many very fine irregular pores; strongly effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk—27 to 60 inches (69 to 152 cm); brown (7.5YR 4/2) clay, very dark brown (7.5YR 2.5/2), moist; 42 percent clay; moderate very fine and fine subangular and angular blocky structure; very hard, extremely firm, very sticky and very plastic; common fine roots; many very fine irregular pores; common fine carbonate filaments on faces of peds; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

## Range in Characteristics

Soil cracks: many vertical cracks 0.25 inch to 2 inches wide from surface to 25 inches or more

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Organic matter: 1 to 2 percent

Average percentage of clay in the control section: 35 to 60 percent

### A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3, dry or moist

Texture: clay loam, silty clay loam

Calcium carbonate equivalent: 0 to 10 percent

### B horizons

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 2 or 3, dry or moist

Texture: clay, clay loam

Calcium carbonate equivalent: 5 to 15 percent

## 22—Cherrycow cobbly clay loam, 5 to 45 percent slopes

### Map Unit Setting

*Landform(s):* pediments

*Elevation:* 4,400 to 5,600 feet (1,341 to 1,707 meters)

*Mean annual precipitation:* 16 to 20 inches (406 to 508 millimeters)

*Mean annual air temperature:* 57 to 62 degrees F (13.9 to 16.7 degrees C)

*Mean annual soil temperature:* 59 to 64 degrees F (15.0 to 17.8 degrees C)

*Frost-free period:* 160 to 210 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-1; Mexican Oak-Pinyon Woodland and Oak Savannah

### Map Unit Composition

Cherrycow and similar soils: 70 percent

Minor components: Slaughter family, Blacktail, Riverwash, Cherrycow, and soils that have hues of 2.5YR; soils very deep containing greater than 35 percent rock fragments

### Soil Properties and Qualities

#### Cherrycow soils

*Taxonomic classification:* Fine, smectitic, thermic Aridic Argiustolls

*Geomorphic position:* generally on crests and side slopes

*Parent material:* slope alluvium derived from welded tuff

*Slope:* 5 to 45 percent

*Surface cover:*

Biological crust

    Cyanobacteria: 0 percent

    Lichen: 0 percent

    Moss: 0 percent

Chemical crust

    Salt: 0 percent

    Gypsum: 0 percent

Physical cover

    Canopy plant cover: 80 percent

    Woody debris: 5 percent

    Bare soil: 15 percent

    Rock fragments:

        • gravel: 25 percent

        • cobble: 45 percent

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

*Drainage class:* moderately well drained

*Ksat solum:* 0.00 to 0.57 inches per hour (0.01 to 4.00 micrometers per second)

*Ksat restrictive layer:* 0.00 to 0.01 inches per hour (0.00 to 0.07 micrometers per second)

*Available water capacity total inches:* 3.7 (low)

*Shrink-swell potential:* about 10.0 LEP (very high)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Loamy Slopes 16-20" p.z.

*Ecological site number:* R041XA107AZ

*Present vegetation:* annual grasses, annual forbs, mesquite, sideoats grama, blue grama, green sprangletop, burroweed, broom snakeweed, cane beardgrass, shrubby buckwheat, spidergrass

*Land capability (nonirrigated):* 6c

### Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—Hookers Hot Springs; about 1,700 feet east and 500 feet north of southwest corner of section 25, Township 13 south, Range 21 east

*Geographic Coordinate System:* 32° 21' 17.30" north, 110° 9' 38.40" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/3) cobbly clay loam, dark brown (7.5YR 3/2), moist; 35 percent clay; weak thin platy parting to moderate very fine subangular blocky structure; soft, very friable, very sticky and very plastic; few medium roots; many very fine irregular pores; 5 percent gravel and 10 percent cobble; noneffervescent; moderately acid, pH 6.0; abrupt smooth boundary.

Bt1—2 to 11 inches (5 to 28 cm); dark brown (7.5YR 3/2) clay, dark brown (7.5YR 3/2), moist; 48 percent clay; strong very fine and fine angular blocky structure; extremely hard, firm, very sticky and very plastic; many very fine roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; 10 percent gravel; noneffervescent; moderately acid, pH 6.0; abrupt smooth boundary.

Bt2—11 to 26 inches (28 to 66 cm); reddish brown (5YR 4/3) clay, reddish brown (5YR 4/3), moist; 58 percent clay; strong medium and coarse angular blocky structure; extremely hard, firm, very sticky and very plastic; many very fine roots; few very fine tubular pores; many distinct pressure faces; many continuous distinct clay films on rock fragments and on faces of peds; 10 percent gravel; noneffervescent; neutral, pH 6.8; abrupt wavy boundary.

R—26 to 60 inches (66 to 152 cm); unweathered welded tuff bedrock.

### Range in Characteristics

Rock fragments: 10 to 25 percent

Organic matter: 1 to 3 percent

Average percentage of clay in the control section: 45 to 60 percent

#### A horizon

Hue: 5YR, 7.5YR

Value: 3 or 4 dry, 2.5 or 3 moist

Chroma: 1 to 3, dry or moist

Texture: loam, clay loam, clay

Reaction: 5.6 to 7.3 (moderately acid to neutral)

#### Bt horizons

Hue: 5YR, 7.5YR

Value: 3 or 4 dry, 2.5 or 4 moist

Chroma: 1 to 3, dry or moist

Texture: clay

Reaction: 5.6 to 7.8 (moderately acid to slightly alkaline)

## 23—Cherrycow-Rock outcrop complex, 5 to 45 percent slopes

### Map Unit Setting

*Landform(s):* hills

*Elevation:* 4,600 to 6,200 feet (1,402 to 1,890 meters)

*Mean annual precipitation:* 16 to 20 inches (406 to 508 millimeters)

*Mean annual air temperature:* 57 to 62 degrees F (13.9 to 16.7 degrees C)

*Mean annual soil temperature:* 59 to 64 degrees F (15.0 to 17.8 degrees C)

*Frost-free period:* 160 to 210 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-1; Mexican Oak-Pine Woodland and Oak Savannah

### Map Unit Composition

Cherrycow and similar soils: 70 percent  
 Rock outcrop: 20 percent  
 Minor components: Cherrycow soils with less clay and greater than 35 percent rock fragments

### Soil Properties and Qualities

#### Cherrycow soils

*Taxonomic classification:* Fine, smectitic, thermic Aridic Argiustolls

*Geomorphic position:* generally on crests and side slopes

*Parent material:* slope alluvium derived from andesite

*Slope:* 5 to 45 percent

*Surface cover:*

Biological crust

  Cyanobacteria: 0 percent

  Lichen: 0 percent

  Moss: 0 percent

Chemical crust

  Salt: 0 percent

  Gypsum: 0 percent

Physical cover

  Canopy plant cover: 50 percent

  Woody debris: 5 percent

  Bare soil: 45 percent

  Rock fragments:

    • gravel: 15 percent

    • cobble: 35 percent

    • stone: 5 percent

*Depth to restrictive feature(s):* 15 to 30 inches to bedrock, lithic

*Drainage class:* moderately well drained

*Ksat solum:* 0.00 to 1.98 inches per hour (0.01 to 14.00 micrometers per second)

*Ksat restrictive layer:* 0.00 to 0.01 inches per hour (0.00 to 0.07 micrometers per second)

*Available water capacity total inches:* 2.5 (very low)

*Shrink-swell potential:* about 10.0 LEP (very high)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Volcanic Hills 16-20" p.z.

*Ecological site number:* R041XA111AZ

*Present vegetation:* curly mesquite, blue grama, sideoats grama, Palmer agave, burroweed, mesquite, broom snakeweed, black grama, green sprangletop, perennial forbs, plains lovegrass, plains bristlegrass, pricklypear, cholla, sotol, yerba de pasmo

*Land capability (nonirrigated):* 6c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—Steele Hills; about 300 feet north and 2,000 feet east of the southwest corner of section 29, Township 14 south, Range 23 east  
*Geographic Coordinate System:* 32° 10' 55.00" north, 110° 1' 23.00" west

A—0 to 7 inches (0 to 18 cm); brown (7.5YR 4/2) very cobbly loam, black (7.5YR 2.5/1), moist; 22 percent clay; weak fine granular parting to moderate very fine and fine subangular blocky structure; soft, very friable, slightly sticky and moderately plastic; few medium roots; few very fine tubular pores; 10 percent gravel and 45 percent cobble; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

Bt1—7 to 16 inches (18 to 41 cm); very dark gray (5YR 3/1) clay, very dark gray (5YR 3/1), moist; 58 percent clay; strong fine and medium angular blocky structure; very hard, extremely firm, very sticky and very plastic; many very fine roots; common very fine tubular pores; many continuous distinct organic stains on faces of peds; many continuous distinct pressure faces; many continuous distinct clay films on rock fragments and on faces of peds; 5 percent gravel; noneffervescent; neutral, pH 6.6; clear smooth boundary.

Bt2—16 to 22 inches (41 to 56 cm); dark reddish brown (5YR 3/3) gravelly clay, dark reddish brown (5YR 3/3), moist; 55 percent clay; strong fine and medium angular blocky structure; extremely hard, slightly rigid, very sticky and very plastic; many very fine roots; common very fine tubular pores; many continuous distinct organic stains on faces of peds; many continuous distinct pressure faces; many continuous distinct clay films on rock fragments and on faces of peds; 20 percent gravel; noneffervescent; neutral, pH 6.6; abrupt wavy boundary.

R—22 to 60 inches (56 to 152 cm); unweathered andesite bedrock.

### Range in Characteristics

Organic matter: 1 to 3 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

#### A horizon

Hue: 7.5YR, 10YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Texture: sandy loam, loam, clay loam

Clay content: 15 to 30 percent

Rock fragments: 30 to 55 percent

#### Bt horizons

Hue: 7.5YR, 5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 to 4, dry or moist

Texture: clay loam, clay

Clay content: 40 to 60 percent

Rock fragments: 0 to 20 percent

### Rock outcrop

Rock outcrop consists of barren rock that occurs as ledges, massive piles, and nearly vertical cliffs of andesite. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the summit of hills.

## 24—Cherrycow-Slaughter family complex, 5 to 25 percent slopes

### Map Unit Setting

*Landform(s):* pediments

*Elevation:* 4,400 to 5,600 feet (1,341 to 1,707 meters)

*Mean annual precipitation:* 16 to 20 inches (406 to 508 millimeters)

*Mean annual air temperature:* 57 to 62 degrees F (13.9 to 16.7 degrees C)

*Mean annual soil temperature:* 59 to 64 degrees F (15.0 to 17.8 degrees C)

*Frost-free period:* 160 to 210 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-1; Mexican Oak-Pine Woodland and Oak Savannah

### Map Unit Composition

Cherrycow and similar soils: 45 percent

Slaughter family and similar soils: 35 percent

Minor components: Carbine, Hathaway, Cazador

### Soil Properties and Qualities

#### Cherrycow soils

*Taxonomic classification:* Fine, smectitic, thermic Aridic Argiustolls

*Geomorphic position:* generally on crests and side slopes

*Parent material:* slope alluvium derived from welded tuff

*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: 40 percent

    Woody debris: 5 percent

    Bare soil: 40 percent

    Rock fragments:

        • gravel: 55 percent

*Depth to restrictive feature(s):* 20 to 30 inches to bedrock, lithic

*Drainage class:* moderately well drained

*Ksat solum:* 0.00 to 5.95 inches per hour (0.01 to 42.00 micrometers per second)

*Ksat restrictive layer:* 0.00 to 0.01 inches per hour (0.00 to 0.07 micrometers per second)

*Available water capacity total inches:* 3.1 (low)

*Shrink-swell potential:* about 10.0 LEP (very high)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Loamy Upland 16-20" p.z.

*Ecological site number:* R041XA108AZ

*Present vegetation:* annual grasses, blue grama, tobosa, sideoats grama, snakeweed, sacahuista, mesquite, black grama, cane beardgrass, perennial forbs

*Land capability (nonirrigated):* 6c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Steele Hills; about 1,000 feet north and 100 feet west of the southeast corner of section 36, Township 14 south, Range 22 east

*Geographic Coordinate System:* 32° 9' 46.80" north, 110° 3' 8.00" west

A—0 to 2 inches (0 to 5 cm); dark brown (7.5YR 3/3) sandy loam, dark brown (7.5YR 3/3), moist; 15 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 10 percent gravel; noneffervescent; slightly acid, pH 6.4; abrupt smooth boundary.

Bt1—2 to 9 inches (5 to 23 cm); dark reddish brown (5YR 3/3) clay, dark reddish brown (5YR 3/3), moist; 58 percent clay; strong very fine and fine subangular blocky structure; hard, firm, very sticky and very plastic; many very fine roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; common continuous distinct organic stains on faces of peds; many distinct pressure faces; 5 percent gravel; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

Bt2—9 to 23 inches (23 to 58 cm); reddish brown (5YR 4/4) clay, reddish brown (5YR 4/4), moist; 55 percent clay; strong very fine and fine and medium subangular blocky structure; extremely hard, firm, very sticky and very plastic; common very fine roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; common continuous distinct organic stains on faces of peds; many distinct pressure faces; 10 percent gravel; noneffervescent; neutral, pH 6.8; abrupt wavy boundary.

R—23 to 60 inches (58 to 152 cm); unweathered welded tuff bedrock.

### Range in Characteristics

Rock fragments: 5 to 25 percent

Organic matter: 1 to 3 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average percentage of clay in the control section: 45 to 60 percent

#### A horizon

Hue: 7.5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Texture: sandy loam, clay loam

#### Bt horizons

Hue: 5YR, 7.5YR

Value: 3 or 4 dry, 2 to 4 moist

Chroma: 1 to 4, dry or moist

Texture: clay, clay loam

### Slaughter family

*Taxonomic classification:* Clayey, mixed, superactive, thermic, shallow Petrocalcic Paleustolls

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed calcareous fan alluvium

*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: 90 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

- gravel: 15 percent

- cobble: 15 percent

*Depth to restrictive feature(s):* 15 to 30 inches to petrocalcic; 30 to 60 inches to bedrock, lithic

*Drainage class:* moderately well drained

*Ksat solum:* 0.06 to 5.95 inches per hour (0.42 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:* 2.4 (very low)

*Shrink-swell potential:* about 7.5 LEP (high)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Loamy Upland 16-20" p.z.

*Ecological site number:* R041XA108AZ

*Present vegetation:* annual grasses, blue grama, tobosa, sideoats grama, snakeweed, sacahuista, mesquite, black grama, cane beardgrass, perennial forbs

*Land capability (nonirrigated):* 6c

### Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—Steele Hills; about 2,500 feet west and 1,200 feet north of the southeast corner of section 1, Township 15 south, Range 22 east

*Geographic Coordinate System:* 32° 9' 19.00" north, 110° 3' 14.00" west

A—0 to 3 inches (0 to 8 cm); brown (7.5YR 5/3) sandy loam, dark brown (7.5YR 3/3), moist; 10 percent clay; weak thin platy parting to moderate very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine roots; common very fine vesicular pores; 10 percent gravel; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

Bt1—3 to 14 inches (8 to 36 cm); dark reddish gray (5YR 4/2) clay, dark reddish brown (5YR 3/2), moist; 58 percent clay; strong fine and medium prismatic parting to strong fine and medium angular blocky structure; hard, very firm, very sticky and very plastic; many fine and few medium roots; many very fine and fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; 10 percent gravel; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

Bt2—14 to 18 inches (36 to 46 cm); reddish brown (5YR 4/3) gravelly clay, reddish brown (5YR 4/3), moist; 58 percent clay; strong fine and medium angular blocky structure; hard, very firm, very sticky and very plastic; common very fine roots; many very fine irregular pores; many continuous distinct clay films on rock fragments and on faces of pedis; 20 percent gravel; noneffervescent; neutral, pH 7.0; abrupt wavy boundary.

2Bkm—18 to 30 inches (46 to 152 cm); cemented material, indurated, ¼-inch laminar cap, cemented by carbonate.

R—30 to 60 inches (76 to 152 cm); unweathered welded tuff bedrock.

### Range in Characteristics

Rock fragments: 5 to 20 percent

Organic matter: 1 to 3 percent

Reaction: 6.6 to 7.3 (neutral)

Average percentage of clay in the control section: 35 to 60 percent

#### A horizon

Hue: 7.5YR

Value: 4 or 5 dry, 3 moist

Chroma: 2 or 3, dry or moist

Texture: sandy loam, sandy clay loam

#### Bt horizons

Hue: 5YR, 7.5YR

Value: 3 to 5 dry, 3 or 4 moist

Chroma: 2 or 3, dry or moist

Texture: clay

#### Bkm horizon

Cemented: calcium carbonate

Hardness: very strongly cemented to indurated

Thickness: 5 to 20 inches

Slaughter series is moist in the soil moisture control section during May and June and occur in the Great Plains. In addition, the series does not have unweathered bedrock below the petrocalcic horizon.

## 25—Combate sandy loam, 0 to 5 percent slopes

### Map Unit Setting

*Landform(s):* alluvial fans

*Elevation:* 3,700 to 4,500 feet (1,128 to 1,372 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Combate and similar soils: 70 percent

Minor components: Bodecker, Baboquivari, Romero, Oracle

### Soil Properties and Qualities

#### Combat soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, nonacid, thermic Ustic Torrifuvents

*Geomorphic position:* inset between terraces and hills

*Parent material:* mixed fan alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 55 percent

Woody debris: 5 percent

Bare soil: 35 percent

Rock fragments:

- gravel: 5 percent

*Drainage class:* well 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:* rare

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Sandy Loam 12-16" p.z. Deep

*Ecological site number:* R041XC318AZ

*Present vegetation:* sideoats grama, mesquite, black grama, catclaw acacia

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—St. David; about 1,750 feet south and 300 feet west of the northeast corner of section 10, Township 17 south, Range 21 east

*Geographic Coordinate System:* 31° 58' 18.60" north, 110° 10' 48.70" west

C1—0 to 14 inches (0 to 36 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 10 percent clay; weak thin and thick platy parting to weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and tubular pores; 5 percent gravel; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

C2—14 to 36 inches (36 to 91 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; moderate very fine and fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine roots; many very fine tubular pores; 7 percent gravel; noneffervescent; neutral, pH 7.0; clear smooth boundary.

C3—36 to 60 inches (91 to 152 cm); strong brown (7.5YR 5/6) loamy sand, strong brown (7.5YR 4/6), moist; 8 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; 7 percent gravel; noneffervescent; neutral, pH 6.8.

### Range in Characteristics

Rock fragments: 5 to 20 percent  
 Reaction: 6.6 to 8.4 (neutral to moderately alkaline)  
 Average percentage of clay in control section: 5 to 18 percent

#### C horizons

Hue: 10YR, 7.5YR  
 Value: 3 to 5 dry, 3 or 4 moist  
 Chroma: 2 to 6, dry or moist  
 Texture: sandy loam, coarse sandy loam, loamy sand, loamy fine sand

## 26—Combate-Baboquivari complex, 0 to 3 percent slopes

### Map Unit Setting

*Landform(s)*: Combate—alluvial fans; Baboquivari—fan and stream terraces  
*Elevation*: 3,700 to 4,500 feet (1,128 to 1,372 meters)  
*Mean annual precipitation*: 12 to 16 inches (305 to 406 millimeters)  
*Mean annual air temperature*: 60 to 67 degrees F (15.5 to 19.4 degrees C)  
*Mean annual soil temperature*: 62 to 69 degrees F (16.6 to 20.5 degrees C)  
*Frost-free period*: 180 to 230 days  
*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range  
*Land Resource Unit*: 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Combate and similar soils: 50 percent  
 Baboquivari and similar soils: 35 percent  
 Minor components: Sasabe, Durazo, Romero, and Oracle

### Soil Properties and Qualities

#### Combate soils

*Taxonomic classification*: Coarse-loamy, mixed, superactive, nonacid, thermic Ustic  
 Torrifluvents

*Geomorphic position*: inset between terraces

*Parent material*: mixed fan alluvium

*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: 75 percent

Woody debris: 0 percent

Bare soil: 25 percent

Rock fragments: 0 percent

*Drainage class:* well drained  
*Ksat solum:* 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)  
*Available water capacity total inches:* 6.6 (moderate)  
*Shrink-swell potential:* about 1.5 LEP (low)  
*Flooding hazard:* rare  
*Runoff class:* low  
*Hydrologic group:* B  
*Ecological site name:* Sandy Loam 12-16" p.z. Deep  
*Ecological site number:* R041XC318AZ  
*Present vegetation:* Lehmann's lovegrass, mesquite, annual grasses, black grama, Arizona cottontop, Rothrock's grama, blue grama  
*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Knob Hill; about 2,600 feet north and 400 feet east of southwest corner of section 34, Township 17 south, Range 22 east  
*Geographic Coordinate System:* 31° 54' 41.60" north, 110° 5' 36.50" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) loamy sand, dark brown (7.5YR 3/4), moist; 8 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; 5 percent gravel; noneffervescent; slightly acid, pH 6.2; abrupt smooth boundary.

C1—2 to 17 inches (5 to 43 cm); brown (7.5YR 4/4) sandy loam, dark brown (7.5YR 3/4), moist; 12 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and few medium roots; many very fine tubular pores; 5 percent gravel; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

C2—17 to 42 inches (43 to 107 cm); brown (7.5YR 4/4) sandy loam, dark brown (7.5YR 3/4), moist; 14 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; many very fine and fine tubular pores; 5 percent gravel; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

2Bbt—42 to 60 inches (107 to 152 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 14 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; many very fine irregular pores; common continuous distinct clay bridges between sand grains; 10 percent gravel; noneffervescent; neutral, pH 6.8.

### Range in Characteristics

Rock fragments: 5 to 20 percent  
 Reaction: 6.1 to 7.3 (slightly acid to neutral)  
 Average percentage of clay in control section: 5 to 16 percent  
 Calcium carbonate equivalent: 0 to 3 percent below 20 inches

#### A and C horizons

Hue: 10YR, 7.5YR  
 Value: 3 to 5 dry, 3 or 4 moist  
 Chroma: 2 to 4, dry or moist  
 Texture: sandy loam, coarse sandy loam, loamy sand, loamy fine sand

#### 2Bbt horizon

Hue: 10YR, 7.5YR  
 Value: 3 to 5 dry, 3 or 4 moist  
 Chroma: 2 to 4, dry or moist

Texture: sandy loam, coarse sandy loam

### **Baboquivari soils**

*Taxonomic classification:* Fine-loamy, mixed, superactive, thermic Ustic Haplargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*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: 65 percent

Woody debris: 5 percent

Bare soil: 30 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:* 7.7 (high)

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* none

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Loamy Upland 12-16" p.z.

*Ecological site number:* R041XC313AZ

*Present vegetation:* Lehmann's lovegrass, mesquite, annual grasses, black grama,

Arizona cottontop, Rothrock's grama, blue grama, soaptree yucca

*Land capability (nonirrigated):* 6c

### **Typical Profile**

#### *Location*

*Public Land Survey:* USGS Quadrangle—Knob Hill; about 2,700 feet north and 500

feet east of the southwest corner of section 34, Township 17 south, Range 22 east

*Geographic Coordinate System:* 31° 54' 41.90" north, 110° 5' 33.50" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 3/4), moist; 8 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; noneffervescent; moderately acid, pH 6.0; abrupt smooth boundary.

Bt1—2 to 24 inches (5 to 61 cm); brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 3/4), moist; 24 percent clay; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few medium roots; many very fine tubular pores; many continuous distinct clay bridges between sand grains and many continuous distinct clay films on rock fragments and on faces of peds; 5 percent gravel; noneffervescent; slightly acid, pH 6.4; abrupt smooth boundary.

Bt2—24 to 40 inches (61 to 102 cm); reddish brown (5YR 4/4) sandy clay loam, reddish brown (5YR 4/4), moist; 24 percent clay; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic;

few very fine roots; many very fine tubular pores; many continuous distinct clay bridges between sand grains and many continuous distinct clay films on rock fragments and on faces of peds; 5 percent gravel; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

Bt3—40 to 60 inches (102 to 152 cm); reddish brown (5YR 4/4) sandy loam, reddish brown (5YR 4/4), moist; 12 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; many continuous distinct clay bridges between sand grains and many continuous distinct clay films on rock fragments and on faces of peds; 5 percent gravel; noneffervescent; neutral, pH 7.2.

### Range in Characteristics

Rock fragments: 5 to 15 percent

Reaction: 5.6 to 7.3 (moderately acid to neutral)

Average percentage of clay in control section: 20 to 30 percent

#### A horizon

Hue: 10YR, 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 to 4, dry or moist

Texture: sandy loam, loamy sand, coarse sandy loam

#### Bt horizons

Hue: 7.5YR, 5YR

Value: 3 to 5 dry, 3 or 4 moist

Chroma: 2 to 4, dry or moist

Texture: loam, sandy clay loam, sandy loam

## 27—Contention and Monzingo soils, 5 to 60 percent slopes

### Map Unit Setting

*Landform(s)*: dissected relict lakebeds

*Elevation*: 3,600 to 4,100 feet (1,097 to 1,250 meters)

*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature*: 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period*: 190 to 260 days

*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range

*Land Resource Unit*: 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### Map Unit Composition

This is an undifferentiated map unit. These components are not consistently associated geographically. At least one component is present in every delineation, but each delineation can have any combination of the components. Minor components: Redington, Queencreek, soils that are shallow to bedrock, soils that have hardpans

### Soil Properties and Qualities

#### Contention soils

*Taxonomic classification*: Fine, smectitic, thermic Typic Gypsiteggers

*Geomorphic position*: generally on crests and side slopes

*Parent material:* gypsiferous and calcareous lacustrine deposits

*Slope:* 5 to 60 percent

*Surface cover:*

Biological crust

    Cyanobacteria: 30 percent

    Lichen: 0 percent

    Moss: 0 percent

Chemical crust

    Salt: 0 percent

    Gypsum: 20 percent

Physical cover

    Canopy plant cover: 20 percent

    Woody debris: 0 percent

    Bare soil: 20 percent

    Rock fragments:

- gravel: 40 percent

*Drainage class:* well drained

*Ksat solum:* 0.00 to 1.98 inches per hour (0.01 to 14.00 micrometers per second)

*Available water capacity total inches:* 8.8 (high)

*Shrink-swell potential:* about 10 LEP (very high)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Clayey Slopes 8-12" p.z.

*Ecological site number:* R041XB216AZ

*Present vegetation:* tobosa, fourwing saltbush, obtuse panicgrass, American tarwort, alkali sacaton, creosotebush, mesquite, wolfberry

*Land capability (nonirrigated):* 7c

### Typical Profile

*Location*

*Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Douglas-Tombstone Part, Arizona; USGS Quadrangle—McGrew Springs; about 3,370 feet east and 800 feet south of the northwest corner of section 24, Township 18 south, Range 20 east

*Geographic Coordinate System:* 31° 51' 34.00" north, 110° 15' 11.00" west

A—0 to 3 inches (0 to 8 cm); reddish brown (5YR 5/3) silt loam, reddish brown (5YR 5/3), moist; 20 percent clay; weak fine granular structure; loose, moderately sticky and very plastic; common very fine and fine roots; many very fine tubular pores; violently effervescent, 8 percent calcium carbonate equivalent and 5 percent gypsum; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bky1—3 to 11 inches (8 to 28 cm); reddish brown (5YR 4/3) silty clay, reddish brown (5YR 5/3), moist; 42 percent clay; moderate medium subangular blocky structure; soft, firm, very sticky and very plastic; common very fine and fine roots; few fine tubular pores; few fine gypsum crystals; common very fine gypsum and carbonate masses; violently effervescent, 12 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bky2—11 to 21 inches (28 to 53 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 42 percent clay; moderate medium wedge and strong medium angular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; few fine tubular pores; common fine gypsum crystals; few fine gypsum and carbonate masses; few fine light yellowish brown (2.5Y 6/3), masses of oxidized iron on faces of

pedes; violently effervescent, 12 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bkssy1—21 to 34 inches (53 to 86 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 48 percent clay; weak fine and medium wedge and strong fine and medium angular blocky structure; hard, firm, very sticky and very plastic; few very fine roots between pedes; few fine tubular pores; common distinct pressure faces and slickensides; common fine gypsum crystals between pedes; few fine gypsum and carbonate masses; violently effervescent, 15 percent calcium carbonate equivalent and 15 percent gypsum; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bkssy2—34 to 60 inches (86 to 152 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 48 percent clay; weak medium wedge and strong fine and medium angular blocky structure; hard, very firm, very sticky and very plastic; few very fine roots between pedes; few fine tubular pores; many distinct pressure faces and slickensides; common fine gypsum crystals between pedes; few fine carbonate masses; common distinct manganese coatings on faces of pedes; violently effervescent, 10 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.8.

### Range in Characteristics

Soil cracks: many vertical cracks 0.12 inch to 1.5 inches wide from the surface to 26 inches or more deep. Pressure faces are common in the lower horizons.

Reaction: 7.4 to 9.0 (slightly to strongly alkaline)

Average percentage of clay in control section: 35 to 60 percent

Calcium carbonate equivalent: 1 to 15 percent

Gypsum content: 1 to 15 percent

#### A horizon

Hue: 7.5YR, 5YR

Value: 4 or 5, dry or moist

Chroma: 2 or 3, dry or moist

Texture: silt loam, silty clay loam

#### Bky and Bkssy horizons

Hue: 7.5YR, 5YR

Value: 5 or 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: clay, silty clay

### Monzingo soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Typic Calcigypsis

*Geomorphic position:* generally on crests and side slopes

*Parent material:* gypsiferous and calcareous lacustrine deposits

*Slope:* 5 to 60 percent

#### *Surface cover:*

Biological crust

Cyanobacteria: 30 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 30 percent

Physical cover

Canopy plant cover: 20 percent

Woody debris: 0 percent

Bare soil: 20 percent

Rock fragments:

- gravel: 40 percent

*Depth to restrictive feature(s):* 16 to 20 inches to densic material; 40 to 50 inches to densic material

*Drainage class:* well drained

*Ksat solum:* 0.03 to 5.95 inches per hour (0.24 to 42.00 micrometers per second)

*Available water capacity total inches:* 2.9 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Limy Upland 8-12" p.z.

*Ecological site number:* R041XB208AZ

*Present vegetation:* creosotebush, catclaw acacia, American tarwort, black grama, blue threeawn, bush muhly, desert zinnia, littleleaf ratany, low woollygrass, ocotillo, pricklyleaf dogweed, rough menodora, twistflower

*Land capability (nonirrigated):* 7c

### Typical Profile

#### *Location*

*Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Douglas-Tombstone Part, Arizona; USGS Quadrangle—Land; about 850 feet west and 1,800 feet south of the northeast corner of section 3, Township 19 south, Range 21 east

*Geographic Coordinate System:* 31° 48' 51.00" north, 110° 11' 0.00" west

A—0 to 3 inches (0 to 8 cm); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4), moist; 8 percent clay; weak thin platy structure; soft, very friable, nonsticky and nonplastic; few fine roots; few fine tubular pores; few fine gypsum and carbonate masses; few fine gypsum crystals; violently effervescent, 12 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt wavy boundary.

Bky—3 to 19 inches (8 to 48 cm); 10 percent strong brown (7.5YR 5/6) and 90 percent light brown (7.5YR 6/4) loam, brown (7.5YR 5/4), moist; 10 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few fine tubular pores; common fine gypsum and carbonate masses; many fine gypsum crystals; violently effervescent, 33 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.8; abrupt wavy boundary.

Cdky—19 to 26 inches (48 to 66 cm); 10 percent strong brown (7.5YR 5/6) and 90 percent light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4), moist; 14 percent clay; weak coarse subangular blocky structure appearing massive in some places; slightly hard, firm, nonsticky and nonplastic; few very fine roots; few fine tubular pores; many continuous distinct carbonate coats on faces of peds; many fine gypsum crystals; many fine gypsum and carbonate masses; violently effervescent, 25 percent calcium carbonate equivalent and 15 percent gypsum; moderately alkaline, pH 8.0; abrupt wavy boundary.

Cky1—26 to 34 inches (66 to 86 cm); 10 percent strong brown (7.5YR 5/6) and 90 percent light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4), moist; 14 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few fine tubular pores; common fine carbonate and gypsum masses; many fine gypsum crystals; few fine distinct manganese coatings in cracks; violently

effervescent, 20 percent calcium carbonate equivalent and 15 percent gypsum; moderately alkaline, pH 8.0; abrupt wavy boundary.

Cky<sub>2</sub>—34 to 45 inches (86 to 114 cm); light brown (7.5YR 6/4) loam, brown (7.5YR 5/4), moist; 14 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few fine tubular pores; common fine carbonate and gypsum masses; many fine gypsum crystals; few fine distinct manganese coatings in cracks; violently effervescent, 20 percent calcium carbonate equivalent and 15 percent gypsum; moderately alkaline, pH 8.0; abrupt wavy boundary.

C'dky—45 to 55 inches (114 to 140 cm); 50 percent light brown (7.5YR 6/4) and 50 percent brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4), moist; 14 percent clay; weak coarse subangular blocky structure appearing massive in some places; very hard, firm, nonsticky and nonplastic; few very fine and fine roots; few fine tubular pores; common fine carbonate and gypsum masses; many fine gypsum crystals; few fine distinct manganese coatings on faces of peds; violently effervescent, 16 percent calcium carbonate equivalent and 15 percent gypsum; moderately alkaline, pH 8.0; abrupt wavy boundary.

Cy—55 to 60 inches (140 to 152 cm); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4), moist; 14 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few fine tubular pores; carbonate, finely disseminated; many fine gypsum crystals; violently effervescent, 11 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 0 to 15 percent

Reaction: 7.4 to 8.4 (slightly or moderately alkaline)

Average percentage of clay in control section: 7 to 18 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 to 4, dry or moist

Texture: fine sandy loam, sandy loam

Calcium carbonate equivalent: 1 to 15 percent

Gypsum content: 0 to 5 percent

#### Bky, Cky, and Cy horizons

Hue: 7.5YR, 10YR

Value: 5 to 8 dry, 4 to 6 moist

Chroma: 2 to 6 dry, 3 or 4 moist

Texture: fine sandy loam, loam, silt loam, sandy loam

Calcium carbonate equivalent: 5 to 35 percent

Gypsum content: 5 to 50 percent

#### Cdky horizons

Dense sediments that are intergrades between soft sediments (C material) and soft bedrock (Cr material). These naturally compacted sediments have been subjected to a slow reduction in volume and increase in density from deep water loading in the geologic past. These materials easily break down in water and roots can penetrate when moist. They are root restrictive when dry.

Hue: 7.5YR, 10YR

Value: 5 or 6 dry, 4 to 6 moist

Chroma: 2, 3, 4, or 6, dry or moist

Texture: fine sandy loam, loam, silt loam, sandy loam

Calcium carbonate equivalent: 5 to 25 percent

Gypsum content: 5 to 50 percent

## 28—Contention gravelly silt loam, 5 to 60 percent slopes

### Map Unit Setting

*Landform(s)*: dissected relict lakebeds

*Elevation*: 3,600 to 4,100 feet (1,097 to 1,250 meters)

*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature*: 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period*: 190 to 260 days

*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range

*Land Resource Unit*: 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### Map Unit Composition

Contention and similar soils: 90 percent

Minor components: Redington, soils that contain less gypsum; Monzingo, soils that are shallow and moderately deep to bedrock

### Soil Properties and Qualities

#### Contention soils

*Taxonomic classification*: Fine, smectitic, thermic Typic Gypsite

*Geomorphic position*: generally on crests and side slopes

*Parent material*: gypsiferous and calcareous lacustrine deposits

*Slope*: 5 to 60 percent

*Surface cover*:

Biological crust

    Cyanobacteria: 40 percent

    Lichen: 0 percent

    Moss: 0 percent

Chemical crust

    Salt: 0 percent

    Gypsum: 30 percent

Physical cover

    Canopy plant cover: 20 percent

    Woody debris: 0 percent

    Bare soil: 10 percent

    Rock fragments:

        • gravel: 35 percent

*Drainage class*: well drained

*Ksat solum*: 0.00 to 1.98 inches per hour (0.01 to 14.00 micrometers per second)

*Available water capacity total inches*: 8.5 (high)

*Shrink-swell potential*: about 10.0 LEP (very high)

*Flooding hazard*: none

*Runoff class*: very high

*Hydrologic group*: D

*Ecological site name*: Clayey Slopes 8-12" p.z.

*Ecological site number*: R041XB216AZ

*Present vegetation*: tobosa, fourwing saltbush, obtuse panicgrass, American tarwort, alkali sacaton, creosotebush, mesquite, wolfberry

*Land capability (nonirrigated)*: 7c

## Typical Profile

### *Location*

*Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Douglas-Tombstone Part, Arizona; USGS Quadrangle—McGrew Springs; about 3,370 feet east and 800 feet south of the northwest corner of section 24, Township 18 south, Range 20 east

*Geographic Coordinate System:* 31° 51' 34.00" north, 110° 15' 11.00" west

A—0 to 3 inches (0 to 8 cm); reddish brown (5YR 5/3) gravelly silt loam, reddish brown (5YR 5/3), moist; 20 percent clay; weak fine granular structure; loose, moderately sticky and very plastic; common very fine and fine roots; many very fine tubular pores; 25 percent gravel; violently effervescent, 8 percent calcium carbonate equivalent and 3 percent gypsum; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bky1—3 to 11 inches (8 to 28 cm); reddish brown (5YR 4/3) silty clay, reddish brown (5YR 5/3), moist; 47 percent clay; moderate medium subangular blocky structure; soft, firm, very sticky and very plastic; common very fine and fine roots; few fine tubular pores; few fine gypsum crystals; common very fine gypsum and carbonate masses; violently effervescent, 12 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bky2—11 to 21 inches (28 to 53 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 47 percent clay; moderate medium wedge and strong medium angular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; few fine tubular pores; common fine gypsum crystals on faces of peds; few fine gypsum and carbonate masses; few fine light yellowish brown (2.5Y 6/3), masses of oxidized iron on faces of peds; violently effervescent, 12 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bkssy1—21 to 34 inches (53 to 86 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 47 percent clay; strong fine and medium angular blocky and weak fine and medium wedge structure; hard, firm, very sticky and very plastic; few very fine roots between peds; few fine tubular pores; common distinct pressure faces and slickensides; common fine gypsum crystals between peds; few fine gypsum and carbonate masses; violently effervescent, 15 percent calcium carbonate equivalent and 15 percent gypsum; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bkssy2—34 to 60 inches (86 to 152 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 47 percent clay; strong fine and medium angular blocky and weak medium wedge structure; hard, very firm, very sticky and very plastic; few very fine roots between peds; few fine tubular pores; many distinct pressure faces and slickensides; few very fine and fine gypsum crystals; few fine gypsum and carbonate masses; common distinct manganese coatings on faces of peds; violently effervescent, 10 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.8.

### Range in Characteristics

Soil cracks: many vertical cracks 0.12 inch to 1.5 inches wide from the surface to 26 inches or more deep. Pressure faces are common in the lower horizons.

Reaction: 7.4 to 9.0 (slightly to strongly alkaline)

Average clay content in control section: 35 to 60 percent

Calcium carbonate equivalent: 1 to 15 percent

Gypsum content: 1 to 15 percent

A horizon

Hue: 7.5YR, 5YR

Value: 4 or 5, dry or moist  
 Chroma: 2 or 3, dry or moist  
 Texture: silt loam, silty clay loam

Bky and Bkssy horizons  
 Hue: 7.5YR, 5YR  
 Value: 5 or 6 dry, 3 to 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: clay, silty clay

## 29—Contention silt loam, 2 to 5 percent slopes

### Map Unit Setting

*Landform(s)*: dissected relict lakebeds  
*Elevation*: 3,600 to 4,100 feet (1,097 to 1,250 meters)  
*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)  
*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)  
*Mean annual soil temperature*: 64 to 70 degrees F (17.8 to 21.1 degrees C)  
*Frost-free period*: 190 to 260 days  
*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range  
*Land Resource Unit*: 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### Map Unit Composition

Contention and similar soils: 90 percent  
 Minor components: Redington, soils that contain less gypsum, Ugyp

### Soil Properties and Qualities

#### Contention soils

*Taxonomic classification*: Fine, smectitic, thermic Typic Gypsitegyp  
*Geomorphic position*: highly dissected and interfluvial  
*Parent material*: gypsiferous and calcareous lacustrine deposits  
*Slope*: 2 to 5 percent  
*Surface cover*:  
   Biological crust  
     Cyanobacteria: 30 percent  
     Lichen: 0 percent  
     Moss: 0 percent  
   Chemical crust  
     Salt: 0 percent  
     Gypsum: 30 percent  
   Physical cover  
     Canopy plant cover: 20 percent  
     Woody debris: 0 percent  
     Bare soil: 20 percent  
     Rock fragments: 0 percent  
*Drainage class*: well drained  
*Ksat solum*: 0.00 to 1.98 inches per hour (0.01 to 14.00 micrometers per second)  
*Available water capacity total inches*: 8.8 (high)  
*Shrink-swell potential*: about 10.0 LEP (very high)  
*Flooding hazard*: none  
*Runoff class*: medium  
*Hydrologic group*: D  
*Ecological site name*: Clayey Swale 8-12" p.z.

*Ecological site number:* R041XB202AZ

*Present vegetation:* tobosa, fourwing saltbush, obtuse panicgrass, American tarwort, alkali sacaton, creosotebush, mesquite, wolfberry

*Land capability (nonirrigated):* 7c

### Typical Profile

#### *Location*

*Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Douglas-Tombstone Part, Arizona; USGS Quadrangle—McGrew Springs; about 3,370 feet east and 800 feet south of the northwest corner of section 24, Township 18 south, Range 20 east

*Geographic Coordinate System:* 31° 51' 34.00" north, 110° 15' 11.00" west

A—0 to 6 inches (0 to 15 cm); reddish brown (5YR 5/3) silt loam, reddish brown (5YR 5/3), moist; 17 percent clay; weak fine granular structure; loose, moderately sticky and very plastic; common very fine and fine roots; many very fine tubular pores; violently effervescent, 8 percent calcium carbonate equivalent and 3 percent gypsum; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bky1—6 to 11 inches (15 to 28 cm); reddish brown (5YR 4/3) silty clay, reddish brown (5YR 5/3), moist; 47 percent clay; moderate medium subangular blocky structure; soft, firm, very sticky and very plastic; common very fine and fine roots; few fine tubular pores; few fine gypsum crystals; common very fine gypsum and carbonate masses; violently effervescent, 12 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bky2—11 to 21 inches (28 to 53 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 47 percent clay; strong medium angular blocky and moderate medium wedge structure; hard, firm, very sticky and very plastic; few very fine roots; few fine tubular pores; common fine gypsum crystals on faces of peds; few fine gypsum and carbonate masses; few fine light yellowish brown (2.5Y 6/3), masses of oxidized iron on faces of peds; violently effervescent, 12 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bkssy1—21 to 34 inches (53 to 86 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 47 percent clay; strong fine and medium angular blocky and weak fine and medium wedge structure; hard, firm, very sticky and very plastic; few very fine roots between peds; few fine tubular pores; common distinct pressure faces and slickensides; common fine gypsum crystals between peds; few fine gypsum and carbonate masses; violently effervescent, 15 percent calcium carbonate equivalent and 15 percent gypsum; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bkssy2—34 to 60 inches (86 to 152 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 47 percent clay; strong fine and medium angular blocky and weak medium wedge structure; hard, very firm, very sticky and very plastic; few very fine roots between peds; few fine tubular pores; many distinct pressure faces and slickensides; few very fine and fine gypsum crystals; few fine gypsum and carbonate masses; common distinct manganese coatings on faces of peds; violently effervescent, 10 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.8.

### Range in Characteristics

Soil cracks: many vertical cracks 0.12 inch to 1.5 inches wide from the surface to 26 inches or more deep. Pressure faces are common in the lower horizons.

Reaction: 7.4 to 9.0 (slightly to strongly alkaline)

Average clay content in the control section: 35 to 60 percent

Calcium carbonate equivalent: 1 to 15 percent

Gypsum content: 1 to 15 percent

A horizon

Hue: 7.5YR, 5YR  
 Value: 4 or 5, dry or moist  
 Chroma: 2 or 3, dry or moist  
 Texture: silt loam, silty clay loam

Bky and Bkssy horizons

Hue: 7.5YR, 5YR  
 Value: 5 or 6 dry, 3 to 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: clay, silty clay

### **30—Contention silty clay loam, saline, 0 to 2 percent slopes**

#### **Map Unit Setting**

*Landform(s)*: dissected relict lakebeds  
*Elevation*: 3,600 to 4,100 feet (1,097 to 1,250 meters)  
*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)  
*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)  
*Mean annual soil temperature*: 64 to 70 degrees F (17.8 to 21.1 degrees C)  
*Frost-free period*: 190 to 260 days  
*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range  
*Land Resource Unit*: 41-2; Chihuahuan-Sonoran Desert Shrub Mix

#### **Map Unit Composition**

Contention and similar soils: 90 percent  
 Minor components: Redington, Monzingo, Queencreek, Ugyp

#### **Soil Properties and Qualities**

##### **Contention soils**

*Taxonomic classification*: Fine, smectitic, thermic Typic Gypsitegyp  
*Geomorphic position*: highly dissected and interfluvial  
*Parent material*: gypsiferous and calcareous lacustrine deposits  
*Slope*: 0 to 2 percent  
*Surface cover*:  
 Biological crust  
 Cyanobacteria: 30 percent  
 Lichen: 0 percent  
 Moss: 0 percent  
 Chemical crust  
 Salt: 0 percent  
 Gypsum: 30 percent  
 Physical cover  
 Canopy plant cover: 20 percent  
 Woody debris: 0 percent  
 Bare soil: 20 percent  
 Rock fragments: 0 percent  
*Drainage class*: well drained  
*Ksat solum*: 0.00 to 0.57 inches per hour (0.01 to 4.00 micrometers per second)

*Available water capacity total inches:* 8.8 (high)

*Shrink-swell potential:* about 10.0 LEP (very high)

*Flooding hazard:* none

*Runoff class:* medium

*Hydrologic group:* D

*Ecological site name:* Clayey Swale 8-12" p.z.

*Ecological site number:* R041XB202AZ

*Present vegetation:* tobosa, fourwing saltbush, obtuse panicgrass, American tarwort, alkali sacaton, creosotebush, mesquite, wolfberry

*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Douglas-Tombstone Part, Arizona; USGS Quadrangle—McGrew Springs; about 3,370 feet east and 800 feet south of the northwest corner of section 24, Township 18 south, Range 20 east

*Geographic Coordinate System:* 31° 51' 34.00" north, 110° 15' 11.00" west

A—0 to 6 inches (0 to 15 cm); reddish brown (5YR 5/3) silty clay loam, reddish brown (5YR 5/3), moist; 35 percent clay; weak fine granular structure; soft, friable, moderately sticky and very plastic; common very fine and fine roots; many very fine tubular pores; violently effervescent, 8 percent calcium carbonate equivalent and 3 percent gypsum; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bky1—6 to 11 inches (15 to 28 cm); reddish brown (5YR 4/3) silty clay, reddish brown (5YR 5/3), moist; 48 percent clay; moderate medium subangular blocky structure; soft, firm, very sticky and very plastic; common very fine and fine roots; few fine tubular pores; few fine gypsum crystals; common very fine gypsum and carbonate masses; violently effervescent, 12 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bky2—11 to 21 inches (28 to 53 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 48 percent clay; strong medium angular blocky and moderate medium wedge structure; hard, firm, very sticky and very plastic; few very fine roots; few fine tubular pores; common fine gypsum crystals on faces of peds; few fine gypsum and carbonate masses; few fine light yellowish brown (2.5Y 6/3), masses of oxidized iron on faces of peds; violently effervescent, 12 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bkssy1—21 to 34 inches (53 to 86 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 48 percent clay; strong fine and medium angular blocky and weak fine and medium wedge structure; hard, firm, very sticky and very plastic; few very fine roots between peds; few fine tubular pores; common distinct pressure faces and slickensides; common fine gypsum crystals between peds; few fine gypsum and carbonate masses; violently effervescent, 15 percent calcium carbonate equivalent and 15 percent gypsum; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bkssy2—34 to 60 inches (86 to 152 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 48 percent clay; strong fine and medium angular blocky and weak medium wedge structure; hard, very firm, very sticky and very plastic; few very fine roots between peds; few fine tubular pores; many distinct pressure faces and slickensides; few very fine and fine gypsum crystals; few fine gypsum and carbonate masses; common distinct manganese coatings on faces of peds; violently effervescent, 10 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.8.

### Range in Characteristics

Soil cracks: many vertical cracks 0.12 inch to 1.5 inches wide from the surface to 26 inches or more deep. Pressure faces are common in the lower horizons.

Reaction: 7.4 to 9.0 (slightly to strongly alkaline)

Average clay content in the control section: 35 to 60 percent

Calcium carbonate equivalent: 1 to 15 percent

Gypsum content: 1 to 15 percent

#### A horizon

Hue: 7.5YR, 5YR

Value: 4 or 5, dry or moist

Chroma: 2 or 3, dry or moist

Texture: silt loam, silty clay loam

#### Bky and Bkssy horizons

Hue: 7.5YR, 5YR

Value: 5 or 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: clay, silty clay

## 31—Contention-Ugyp complex, 0 to 5 percent slopes

### Map Unit Setting

*Landform(s):* alluvial fans

*Elevation:* 3,800 to 4,100 feet (1,158 to 1,250 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### Map Unit Composition

Contention and similar soils: 45 percent

Ugyp and similar soils: 35 percent

Minor components: soils shallow to a hardpan, Redington, Yturbide, Kokan, Yana

### Soil Properties and Qualities

#### Contention soils

*Taxonomic classification:* Fine, smectitic, thermic Typic Gypsite

*Geomorphic position:* inset between dissected relict lakebeds

*Parent material:* gypsiferous and calcareous lacustrine deposits

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

Cyanobacteria: 30 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 30 percent

Physical cover

Canopy plant cover: 20 percent

Woody debris: 0 percent

Bare soil: 20 percent

Rock fragments:

- gravel: 7 percent

*Drainage class:* well drained

*Ksat solum:* 0.00 to 1.98 inches per hour (0.01 to 14.00 micrometers per second)

*Available water capacity total inches:* 9.0 (high)

*Shrink-swell potential:* about 10.0 LEP (very high)

*Flooding hazard:* occasional

*Runoff class:* medium

*Hydrologic group:* D

*Ecological site name:* Clayey Swale 8-12" p.z.

*Ecological site number:* R041XB202AZ

*Present vegetation:* tobosa, fourwing saltbush, obtuse panicgrass, American tarwort, alkali sacaton, creosotebush, mesquite, wolfberry

*Land capability (nonirrigated):* 7c

## Typical Profile

### Location

*Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Douglas-Tombstone Part, Arizona; USGS Quadrangle—McGrew Springs; about 3,370 feet east and 800 feet south of the northwest corner of section 24, Township 18 south, Range 20 east

*Geographic Coordinate System:* 31° 51' 34.00" north, 110° 15' 11.00" west

A—0 to 3 inches (0 to 8 cm); reddish brown (5YR 5/3) loam, reddish brown (5YR 5/3), moist; 18 percent clay; weak fine granular structure; loose, moderately sticky and very plastic; common very fine and fine roots; many very fine tubular pores; violently effervescent, 8 percent calcium carbonate equivalent and 3 percent gypsum; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bky1—3 to 11 inches (8 to 28 cm); reddish brown (5YR 4/3) silty clay loam, reddish brown (5YR 5/3), moist; 35 percent clay; moderate medium subangular blocky structure; soft, firm, very sticky and very plastic; common very fine and fine roots; few fine tubular pores; few fine gypsum crystals; common very fine gypsum masses and carbonate masses; violently effervescent, 12 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bky2—11 to 21 inches (28 to 53 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 48 percent clay; strong medium angular blocky and moderate medium wedge structure; hard, firm, very sticky and very plastic; few very fine roots; few fine tubular pores; common fine gypsum crystals on faces of peds; few fine gypsum and carbonate masses; few fine light yellowish brown (2.5Y 6/3), masses of oxidized iron on faces of peds; violently effervescent, 12 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bkssy1—21 to 34 inches (53 to 86 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 48 percent clay; strong fine and medium angular blocky and weak fine and medium wedge structure; hard, firm, very sticky and very plastic; few very fine roots between peds; few fine tubular pores; common distinct pressure faces and slickensides; common fine gypsum crystals between peds; few fine gypsum and

carbonate masses; violently effervescent, 15 percent calcium carbonate equivalent and 15 percent gypsum; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bkssy2—34 to 60 inches (86 to 152 cm); reddish brown (5YR 5/3) clay, reddish brown (5YR 5/3), moist; 48 percent clay; strong fine and medium angular blocky and weak medium wedge structure; hard, very firm, very sticky and very plastic; few very fine roots between peds; few fine tubular pores; many distinct pressure faces and slickensides; few very fine and fine gypsum crystals; few fine gypsum and carbonate masses; common distinct manganese coatings on faces of peds; violently effervescent, 10 percent calcium carbonate equivalent and 15 percent gypsum; slightly alkaline, pH 7.8.

### Range in Characteristics

Soil cracks: many vertical cracks 0.12 inch to 1.5 inches wide from the surface to 26 inches or more deep. Pressure faces are common in the lower horizons.

Reaction: 7.4 to 9.0 (slightly to strongly alkaline)

Average clay content in the control section: 35 to 60 percent

Calcium carbonate equivalent: 1 to 15 percent

Gypsum content: 1 to 15 percent

#### A horizon

Hue: 7.5YR, 5YR

Value: 4 or 5, dry or moist

Chroma: 2 or 3, dry or moist

Texture: silt loam, silty clay loam, loam

#### Bky and Bkssy horizons

Hue: 7.5YR, 5YR

Value: 5 or 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: clay, silty clay

### Ugyp soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Typic Calcigypsis

*Geomorphic position:* inset between dissected relict lakebeds

*Parent material:* mixed fan alluvium

*Slope:* 0 to 5 percent

#### *Surface cover:*

##### Biological crust

Cyanobacteria: 30 percent

Lichen: 0 percent

Moss: 0 percent

##### Chemical crust

Salt: 0 percent

Gypsum: 30 percent

##### Physical cover

Canopy plant cover: 20 percent

Woody debris: 0 percent

Bare soil: 20 percent

Rock fragments: 0 percent

*Drainage class:* well drained

*Ksat solum:* 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

*Available water capacity total inches:* 7.3 (high)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* occasional

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Gypsum Upland 8-12" p.z.

*Ecological site number:* R041XB219AZ

*Present vegetation:* bush muhly, American tarwort, tobosa, creosotebush, alkali sacaton, burrograss, crown of thorns, fourwing saltbush, giant sacaton, sand dropseed, sideoats grama, mesquite, wolfberry

*Land capability (nonirrigated):* 7c

## Typical Profile

### *Location*

*Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Douglas-Tombstone Part, Arizona; USGS Quadrangle—Land; about 1,000 feet east and 1,700 feet south of the northwest corner of section 30, Township 18 south, Range 21 east

*Geographic Coordinate System:* 31° 50' 13.00" north, 110° 14' 40.00" east

A—0 to 3 inches (0 to 8 cm); light brown (7.5YR 6/3) fine sandy loam, brown (7.5YR 5/4), moist; 12 percent clay; weak thin platy and weak very fine granular structure; loose, slightly sticky and moderately plastic; common very fine roots; common very fine irregular pores; carbonate, finely disseminated; 3 percent gravel; violently effervescent, 11 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bky1—3 to 13 inches (8 to 33 cm); brown (7.5YR 5/4) silt loam, brown (7.5YR 4/3), moist; 12 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky and moderately plastic; common very fine and fine roots; few fine tubular pores; common very fine and fine carbonate and gypsum filaments; few very fine gypsum crystals; violently effervescent, 11 percent calcium carbonate equivalent and 10 percent gypsum; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bky2—13 to 30 inches (33 to 76 cm); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4), moist; 12 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and moderately plastic; common very fine and fine roots; few very fine and fine tubular pores; common very fine and fine carbonate and gypsum filaments; few very fine gypsum crystals; very few distinct organic stains on faces of peds; violently effervescent, 7 percent calcium carbonate equivalent and 10 percent gypsum; moderately alkaline, pH 8.0; clear smooth boundary.

Bky3—30 to 52 inches (76 to 132 cm); light brown (7.5YR 6/4) stratified loamy coarse sand to sandy loam, brown (7.5YR 5/4), moist; 10 percent clay; massive; loose, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine tubular and irregular pores; common very fine and fine carbonate and gypsum filaments; common very fine gypsum crystals; 10 percent gravel; violently effervescent, 12 percent calcium carbonate equivalent and 10 percent gypsum; slightly alkaline, pH 7.6; clear smooth boundary.

Bky4—52 to 60 inches (132 to 152 cm); light brown (7.5YR 6/4) stratified fine sand to loamy fine sand, brown (7.5YR 4/3), moist; 7 percent clay; moderate fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine tubular pores; common very fine and fine carbonate and gypsum filaments; few very fine gypsum crystals; violently effervescent, 6 percent calcium carbonate equivalent and 10 percent gypsum; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 10 to 25 percent  
 Reaction: 7.4 to 8.4 (slightly to moderately alkaline)  
 Average clay content in the control section: 3 to 18 percent

#### A horizon

Hue: 7.5YR, 10YR  
 Value: 5 or 6 dry, 4 or 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: fine sandy loam, sandy loam  
 Calcium carbonate equivalent: 1 to 15 percent

#### Bky horizons

Hue: 7.5YR, 10YR  
 Value: 5 or 6 dry, 4 or 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: silt loam, fine sandy loam, loam, loamy fine sand and also stratified sandy loam to loamy coarse sand  
 Calcium carbonate equivalent: 5 to 30 percent  
 Gypsum content: 5 to 15 percent

## 32—Contention-Whitecliff complex, eroded, 0 to 5 percent slopes

### Map Unit Setting

*Landform(s)*: alluvial fans  
*Elevation*: 3,500 to 4,100 feet (1,067 to 1,250 meters)  
*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)  
*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)  
*Mean annual soil temperature*: 64 to 70 degrees F (17.8 to 21.1 degrees C)  
*Frost-free period*: 190 to 260 days  
*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range  
*Land Resource Unit*: 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### Map Unit Composition

Contention, eroded and similar soils: 55 percent  
 Whitecliff, eroded and similar soils: 35 percent  
 Minor components: Ugyg

### Soil Properties and Qualities

#### Contention, eroded soils

*Taxonomic classification*: Fine, smectitic, thermic Typic Gypsisol  
*Geomorphic position*: inset between dissected relict lakebeds  
*Parent material*: calcareous and gypsiferous lacustrine deposits  
*Slope*: 0 to 5 percent  
*Surface cover*:  
 Biological crust  
   Cyanobacteria: 0 percent  
   Lichen: 0 percent  
   Moss: 0 percent  
 Chemical crust  
   Salt: 0 percent

Gypsum: 10 percent  
 Physical cover  
   Canopy plant cover: 50 percent  
   Woody debris: 10 percent  
   Bare soil: 35 percent  
   Rock fragments: 0 percent  
*Drainage class:* well drained  
*Ksat solum:* 0.00 to 0.20 inches per hour (0.01 to 1.40 micrometers per second)  
*Available water capacity total inches:* 7.2 (high)  
*Shrink-swell potential:* about 10.0 LEP (very high)  
*Flooding hazard:* occasional  
*Runoff class:* medium  
*Hydrologic group:* D  
*Ecological site name:* Clayey Swale 8-12" p.z.  
*Ecological site number:* R041XB202AZ  
*Present vegetation:* mesquite, giant sacaton, fourwing saltbush, tobosa, alkali sacaton, Pima pappusgrass, Rothrock's grama, pepperweed, snakeweed, tarbush  
*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Benson; about 2,200 feet east and 700 feet north of the southwest corner of section 1, Township 17 south, Range 20 east  
*Geographic Coordinate System:* 31° 58' 37.80" north, 110° 15' 28.50" west

ABky—0 to 3 inches (0 to 8 cm); brown (7.5YR 5/4) clay, brown (7.5YR 4/4), moist; 40 percent clay; strong thin and medium platy parting to moderate very fine and fine subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; many very fine and fine roots; many very fine vesicular and common very fine and fine tubular pores; common fine carbonate and gypsum masses; strongly effervescent, 10 percent calcium carbonate equivalent and 5 percent gypsum; slightly alkaline, pH 7.8; abrupt smooth boundary.

Bkssy1—3 to 12 inches (8 to 30 cm); brown (7.5YR 5/4) clay, brown (7.5YR 4/4), moist; 50 percent clay; strong fine and medium angular and subangular blocky structure; hard, friable, very sticky and very plastic; common very fine roots; few very fine irregular and many very fine and fine tubular pores; few distinct pressure faces and slickensides; common fine carbonate and gypsum masses; strongly effervescent, 10 percent calcium carbonate equivalent and 10 percent gypsum; moderately alkaline, pH 8.0; clear smooth boundary.

Bkssy2—12 to 28 inches (30 to 71 cm); brown (7.5YR 5/4) clay, brown (7.5YR 4/4), moist; 55 percent clay; strong fine, medium, and coarse angular blocky structure; extremely hard, friable, very sticky and very plastic; common very fine roots; few fine irregular and many very fine and fine tubular pores; common distinct pressure faces and slickensides; common fine carbonate and gypsum masses; violently effervescent, 13 percent calcium carbonate equivalent and 10 percent gypsum; moderately alkaline, pH 8.0; gradual smooth boundary.

Bkssy3—28 to 60 inches (71 to 152 cm); brown (7.5YR 5/4) clay, brown (7.5YR 4/4), moist; 50 percent clay; strong fine, medium, and coarse angular blocky structure; extremely hard, friable, very sticky and very plastic; common very fine roots; few fine irregular and many very fine and fine tubular pores; few distinct pressure faces and slickensides; common fine carbonate and gypsum masses; few distinct iron-

manganese masses on faces of peds; violently effervescent, 12 percent calcium carbonate equivalent and 10 percent gypsum; moderately alkaline, pH 8.0.

### Range in Characteristics

Soil cracking: many vertical cracks 0.25 inch to 2 inches wide and from the surface to a depth of 30 inches

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 35 to 60 percent

Calcium carbonate equivalent: 1 to 15 percent

Gypsum content: 1 to 15 percent

#### A horizon

Hue: 7.5YR, 5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: loam, clay, silty clay

#### B horizons

Hue: 7.5YR, 5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: clay, silty clay, silty clay loam

### Whitecliff, eroded soils

*Taxonomic classification:* Fine-silty, mixed, superactive, thermic Leptic Haplogypsis

*Geomorphic position:* inset between relict lakebeds

*Parent material:* calcareous and gypsiferous lacustrine deposits

*Slope:* 0 to 5 percent

#### *Surface cover:*

##### Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

##### Chemical crust

Salt: 0 percent

Gypsum: 10 percent

##### Physical cover

Canopy plant cover: 50 percent

Woody debris: 10 percent

Bare soil: 35 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:* 7.6 (high)

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* occasional

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Gypsum Upland 8-12" p.z.

*Ecological site number:* R041XB219AZ

*Present vegetation:* creosotebush, mesquite, bush muhly, tarbush, Pima pappusgrass, tansy mustard

*Land capability (nonirrigated):* 7c

## Typical Profile

### *Location*

*Public Land Survey:* USGS Quadrangle—Benson; about 3,300 feet east and 200 feet north of the southwest corner of section 1, Township 17 south, Range 20 east

*Geographic Coordinate System:* 31° 58' 34.20" north, 110° 15' 11.10" west

A—0 to 1 inch (0 to 3 cm); brown (7.5YR 5/4) loam, brown (7.5YR 4/4), moist; 20 percent clay; moderate thin and medium platy parting to weak fine subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; many very fine roots; many very fine tubular pores; strongly effervescent, 6 percent calcium carbonate equivalent and 5 percent gypsum; slightly alkaline, pH 7.8; clear smooth boundary.

Bky1—1 to 10 inches (3 to 25 cm); brown (7.5YR 5/4) loam, brown (7.5YR 4/4), moist; 25 percent clay; moderate fine and medium subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; many very fine and common fine and medium roots; many very fine irregular and tubular pores; few continuous distinct organic stains on faces of pedis; common fine gypsum and carbonate masses; strongly effervescent, 8 percent calcium carbonate equivalent and 5 percent gypsum; moderately alkaline, pH 8.0; clear smooth boundary.

Bky2—10 to 23 inches (25 to 58 cm); brown (7.5YR 5/4) loam, brown (7.5YR 4/4), moist; 25 percent clay; moderate fine and medium angular blocky structure; slightly hard, very friable, moderately sticky and moderately plastic; many very fine and common fine and medium roots; many very fine and fine tubular and irregular pores; common fine gypsum and carbonate masses; strongly effervescent, 7 percent calcium carbonate equivalent and 10 percent gypsum; moderately alkaline, pH 8.0; gradual smooth boundary.

Bky3—23 to 43 inches (58 to 109 cm); brown (7.5YR 4/4) clay loam, brown (7.5YR 4/4), moist; 27 percent clay; strong fine, medium, and coarse angular blocky structure; hard, friable, moderately sticky and moderately plastic; many very fine and common fine roots; many very fine and fine tubular and irregular pores; common fine gypsum and carbonate masses; strongly effervescent, 7 percent calcium carbonate equivalent and 10 percent gypsum; moderately alkaline, pH 8.0; clear smooth boundary.

Bky4—43 to 60 inches (109 to 152 cm); brown (7.5YR 4/4) loam, brown (7.5YR 4/4), moist; 25 percent clay; moderate medium and coarse subangular blocky structure; moderately hard, very friable, moderately sticky and moderately plastic; many very fine roots; many very fine tubular and common very fine interstitial pores; common fine gypsum and carbonate masses; 5 percent gravel; strongly effervescent, 7 percent calcium carbonate equivalent and 10 percent gypsum; slightly alkaline, pH 7.8.

## Range in Characteristics

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 18 to 35 percent

Calcium carbonate equivalent: 5 to 10 percent

Gypsum content: 5 to 15 percent

### A horizon

Hue: 7.5YR, 10YR

Value: 4 to 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist  
 Texture: loam, silt loam

**B horizons**

Hue: 7.5YR, 10YR  
 Value: 4 to 6 dry, 3 or 4 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: loam, clay loam, silty clay loam

### **33—Courthouse-Perilla complex, 3 to 30 percent slopes**

#### **Map Unit Setting**

*Landform(s)*: Perilla—fan terraces; Courthouse—hills  
*Elevation*: 3,600 to 4,000 feet (1,097 to 1,219 meters)  
*Mean annual precipitation*: 12 to 16 inches (305 to 406 millimeters)  
*Mean annual air temperature*: 60 to 67 degrees F (15.5 to 19.4 degrees C)  
*Mean annual soil temperature*: 62 to 69 degrees F (16.6 to 20.5 degrees C)  
*Frost-free period*: 180 to 230 days  
*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range  
*Land Resource Unit*: 41-3; Southern Arizona Semidesert Grassland

#### **Map Unit Composition**

Courthouse and similar soils: 40 percent  
 Perilla and similar soils: 35 percent  
 Minor components: Nalam, Eloma, Stronghold

#### **Soil Properties and Qualities**

##### **Courthouse soils**

*Taxonomic classification*: Loamy, mixed, superactive, calcareous, thermic, shallow  
 Ustic Torriorthents

*Geomorphic position*: generally on crests and side slopes

*Parent material*: mixed calcareous alluvium

*Slope*: 3 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: 20 percent

Rock fragments:

• gravel: 55 percent

• cobble: 5 percent

*Depth to restrictive feature(s)*: 10 to 20 inches to bedrock, paralithic; 20 to 30 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:* 1.4 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* C

*Ecological site name:* Limy Upland 12-16" p.z.

*Ecological site number:* R041XC309AZ

*Present vegetation:* creosotebush, whitethorn acacia, black grama, bush muhly, range ratany, perennial forbs, fluffgrass, longleaf Mormon tea, mariola, slim tridens, desert zinnia, ocotillo, ratear coldenia, mesquite

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Soza Mesa; about 1,250 feet south and 50 feet west of the northeast corner of section 22, Township 13 south, Range 20 east

*Geographic Coordinate System:* 32° 17' 32.10" north, 110° 17' 15.10" west

A—0 to 1 inch (0 to 3 cm); reddish brown (5YR 5/3) sandy loam, reddish brown (5YR 4/3), moist; 14 percent clay; weak thin platy parting to weak fine granular structure; loose, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; many continuous distinct carbonate coats on rock fragments; 10 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; clear smooth boundary.

Bk—1 inch to 13 inches (3 to 33 cm); reddish brown (2.5YR 5/3) sandy loam, reddish brown (2.5YR 4/3), moist; 14 percent clay; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; many continuous distinct carbonate coats on rock fragments; 10 percent gravel; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Crk—13 to 20 inches (33 to 51 cm); many continuous distinct carbonate coats on fractures; weathered calcareous sandstone bedrock; abrupt wavy boundary.

R—20 to 60 inches (51 to 152 cm); unweathered calcareous sandstone bedrock.

### Range in Characteristics

Rock fragments: 5 to 20 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in the control section: 7 to 18 percent

Calcium carbonate equivalent: 0 to 5 percent

#### A horizon

Hue: 5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam

#### Bk horizon

Hue: 2.5YR, 5YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam

Courthouse as used in this survey is a taxadjunct to series because it has less than 35 percent rock fragments in the control section. Courthouse is Loamy-skeletal, mixed, superactive, calcareous, thermic, shallow Ustic Torriorthents.

### **Perilla soils**

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Ustic Haplocambids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed calcareous alluvium

*Slope:* 3 to 15 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 50 percent

Woody debris: 15 percent

Bare soil: 35 percent

Rock fragments:

- gravel: 45 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:* 4.8 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* medium

*Hydrologic group:* B

*Ecological site name:* Limy Upland 12-16" p.z.

*Ecological site number:* R041XC309AZ

*Present vegetation:* creosotebush, whitethorn acacia, black grama, bush muhly, range ratany, perennial forbs, fluffgrass, Mormon tea, mariola, slim tridens, desert zinnia, ocotillo, ratear coldenia, mesquite

*Land capability (nonirrigated):* 6c

### **Typical Profile**

#### *Location*

*Public Land Survey:* USGS Quadrangle—Soza Mesa; 50 feet north and 10 feet east of the southwest corner of section 14, Township 13 south, Range 20 east

*Geographic Coordinate System:* 32° 17' 50.20" north, 110° 16' 58.40" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) gravelly sandy loam, brown (7.5YR 4/4), moist; 8 percent clay; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine irregular pores; few continuous distinct carbonate coats on rock fragments; 20 percent gravel; strongly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

Bk1—2 to 20 inches (5 to 51 cm); reddish brown (5YR 4/4) gravelly sandy loam, dark reddish brown (5YR 3/4), moist; 13 percent clay; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine irregular pores; many continuous distinct carbonate coats on rock

fragments; 30 percent gravel; strongly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk2—20 to 60 inches (51 to 152 cm); reddish brown (5YR 4/4) gravelly sandy loam, dark reddish brown (5YR 3/4), moist; 15 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine irregular pores; many continuous distinct carbonate coats on rock fragments; 30 percent gravel; strongly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 15 to 30 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in the control section: 7 to 18 percent

Calcium carbonate equivalent: 0 to 5 percent

#### A horizon

Hue: 7.5YR

Value: 4 or 5 dry or moist

Chroma: 3 or 4 dry or moist

Texture: sandy loam

#### Bk horizons

Hue: 5YR, 7.5YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam

## 34—Courtland-Diaspar complex, 0 to 3 percent slopes

### Map Unit Setting

*Landform(s):* fan terraces

*Elevation:* 3,900 to 4,500 feet (1,189 to 1,372 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Courtland and similar soils: 55 percent

Diaspar and similar soils: 30 percent

Minor components: Bodecker, Eloma, Caralampi, Sasabe

### Soil Properties and Qualities

#### Courtland soils

*Taxonomic classification:* Fine-loamy, mixed, superactive, thermic Ustic Haplargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*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: 80 percent  
   Woody debris: 0 percent  
   Bare soil: 20 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)  
*Flooding hazard:* none  
*Runoff class:* low  
*Hydrologic group:* B  
*Ecological site name:* Sandy Loam Upland 12-16" p.z.  
*Ecological site number:* R041XC319AZ  
*Present vegetation:* Arizona cottontop, blue grama, false mesquite, sideoats grama, littleleaf ratany, rabo de ardilla, blue threeawn, cane beardgrass, mesquite, low woollygrass, yucca  
*Land capability (nonirrigated):* 6c

### Typical Profile

#### *Location*

*Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Douglas-Tombstone Part, Arizona; USGS Quadrangle—Outlaw Mountain; about 2,200 feet north and 1,600 feet east of the southwest corner of section 24, Township 20 south, Range 25 east

*Geographic Coordinate System:* 31° 40' 50.00" north, 109° 45' 10.00" west

A1—0 to 8 inches (0 to 20 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 15 percent clay; moderate medium platy parting to moderate fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots; few fine irregular and common fine vesicular pores; 5 percent gravel; noneffervescent; neutral, pH 7.0; clear smooth boundary.

A2—8 to 14 inches (20 to 36 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 15 percent clay; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine tubular pores; 5 percent gravel; noneffervescent; neutral, pH 7.0; clear wavy boundary.

Bt—14 to 20 inches (36 to 51 cm); reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4), moist; 15 percent clay; moderate fine subangular blocky structure; hard, friable, slightly sticky and nonplastic; few very fine roots; common fine tubular pores; few continuous faint clay films on surfaces along pores and clay bridges between sand grains; 5 percent gravel; noneffervescent; slightly alkaline, pH 7.5; clear wavy boundary.

Btk1—20 to 49 inches (51 to 124 cm); yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6), moist; 28 percent clay; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; few very fine roots; common fine tubular pores; common continuous faint clay films

on surfaces along pores and clay bridges between sand grains; few fine carbonate masses; 5 percent gravel; slightly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

Btk2—49 to 60 inches (124 to 152 cm); red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6), moist; 28 percent clay; moderate medium subangular blocky structure; hard, friable, moderately sticky and slightly plastic; few very fine roots; common fine tubular pores; many continuous faint clay films on surfaces along pores and clay bridges between sand grains; few fine carbonate masses; slightly effervescent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 0 to 20 percent

Reaction: 6.6 to 8.4 (neutral to moderately alkaline)

Average clay content in the control section: 18 to 35 percent

#### A horizons

Hue: 7.5YR, 5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: fine sandy loam, sandy loam

#### Bt horizon

Hue: 2.5YR, 5YR

Value: 4 to 6, dry or moist

Chroma: 4 to 6, dry or moist

Texture: sandy clay loam, sandy loam

#### Btk horizons

Hue: 2.5YR, 5 YR

Value: 4 to 6, dry or moist

Chroma: 4 to 6, dry or moist

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

Calcium carbonate equivalent: 0 to 15 percent

### Diaspar soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Ustic Haplargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*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: 80 percent

Woody debris: 0 percent

Bare soil: 20 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:* 6.9 (moderate)

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* none

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Sandy Loam Upland 12-16" p.z.

*Ecological site number:* R041XC319AZ

*Present vegetation:* Arizona cottontop, Rothrock's grama, black grama, sideoats grama, threeawn, bastardsage, cane beardgrass, fourwing saltbush, rabo de ardilla, sand dropseed, soaptree yucca

*Land capability (nonirrigated):* 6c

## Typical Profile

### Location

*Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Douglas-Tombstone Part, Arizona; USGS Quadrangle—Fort Huachuca about 2,500 feet west and 700 feet south of the northeast corner of section 23, Township 21 south, Range 20 east

*Geographic Coordinate System:* 31° 35' 45.00" north, 110° 16' 0.00" west

A—0 to 2 inches (0 to 5 cm); yellowish red (5YR 4/6) sandy loam, reddish brown (5YR 4/4), moist; 12 percent clay; weak thin platy parting to moderate fine granular structure; soft, very friable, nonsticky and nonplastic; few fine roots; common fine irregular pores; noneffervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

Bt1—2 to 5 inches (5 to 13 cm); yellowish red (5YR 4/6) sandy loam, dark reddish brown (5YR 3/3), moist; 12 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine irregular and tubular pores; few continuous faint clay films on faces of peds, between sand grains, and surfaces along pores and root channels; noneffervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

Bt2—5 to 20 inches (13 to 51 cm); reddish brown (5YR 4/4) sandy loam, reddish brown (5YR 4/4), moist; 12 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; common fine tubular pores; many continuous distinct clay films on faces of peds and on surfaces along pores; many continuous distinct clay bridges between sand grains; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

2Bt1—20 to 32 inches (51 to 81 cm); yellowish red (5YR 4/6) sandy clay loam, yellowish red (5YR 4/6), moist; 30 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine tubular pores; many continuous distinct clay films on faces of peds and on surfaces along pores; many continuous distinct clay bridges between sand grains; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

2Bt2—32 to 41 inches (81 to 104 cm); dark red (2.5YR 3/6) sandy clay loam, red (2.5YR 4/6), moist; 30 percent clay; moderate medium angular blocky structure; slightly hard, firm, moderately sticky and moderately plastic; few fine roots; few fine tubular pores; many continuous distinct clay films on faces of peds, on rock fragments, and on surfaces along pores; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

2Bt3—41 to 60 inches (104 to 152 cm); dark red (2.5YR 3/6) gravelly sandy clay loam, red (2.5YR 4/6), moist; 30 percent clay; strong medium angular blocky structure; slightly hard, firm, moderately sticky and moderately plastic; few fine roots; few fine tubular pores; many continuous distinct clay films on faces of peds, on rock

fragments, and on surfaces along pores; 20 percent gravel; noneffervescent; slightly alkaline, pH 7.6.

### Range in Characteristics

Rock fragments: 0 to 35 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 7 to 18 percent

#### A horizon

Hue: 7.5YR, 5YR

Value: 4 or 5, dry or moist

Chroma: 4 to 6, dry or moist

#### Bt horizons

Hue: 2.5YR, 5YR

Value: 3 to 5, dry or moist

Chroma: 3 to 6, dry or moist

Texture: sandy loam, sandy clay loam

Calcium carbonate equivalent: 0 to 5 percent

## 35—Courtland-Sasabe-Diaspar complex, 1 to 8 percent slopes

### Map Unit Setting

*Landform(s)*: fan terraces

*Elevation*: 3,900 to 4,500 feet (1,189 to 1,372 meters)

*Mean annual precipitation*: 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature*: 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature*: 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period*: 180 to 230 days

*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range

*Land Resource Unit*: 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Sasabe and similar soils: 35 percent

Courtland and similar soils: 35 percent

Diaspar and similar soils: 20 percent

Minor components: Bodecker, Durazo, Combate, Libby, Gulch, Romero, Oracle, Andrada, Eloma, Caralampi

### Soil Properties and Qualities

#### Courtland soils

*Taxonomic classification*: Fine-loamy, mixed, superactive, thermic Ustic Haplargids

*Geomorphic position*: generally on shoulders and side slopes

*Parent material*: mixed fan alluvium

*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:  
 • gravel: 5 percent  
*Drainage class:* well drained  
*Ksat solum:* 0.20 to 39.69 inches per hour (1.40 to 280.00 micrometers per second)  
*Available water capacity total inches:* 5.7 (moderate)  
*Shrink-swell potential:* about 4.5 LEP (moderate)  
*Flooding hazard:* none  
*Runoff class:* medium  
*Hydrologic group:* B  
*Ecological site name:* Sandy Loam Upland 12-16" p.z.  
*Ecological site number:* R041XC319AZ  
*Present vegetation:* annual grasses, false mesquite, mesquite, sideoats grama, Rothrock's grama, feather fingergrass, black grama, tanglehead  
*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Benson; about 800 feet north and 700 feet west of the southeast corner of section 18, Township 17 south, Range 20 east  
*Geographic Coordinate System:* 31° 56' 53.90" north, 110° 19' 56.50" west

A—0 to 3 inches (0 to 8 cm); brown (7.5YR 4/3) loamy sand, dark brown (7.5YR 3/3), moist; 4 percent clay; weak very thin platy parting to weak very fine granular structure; loose, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 10 percent gravel; noneffervescent; slightly acid, pH 6.4; abrupt smooth boundary.

Bt1—3 to 24 inches (8 to 61 cm); reddish brown (5YR 4/3) gravelly sandy clay loam, dark reddish brown (5YR 3/4), moist; 31 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky and slightly plastic; many very fine and fine and few medium roots; many very fine and fine tubular pores; many continuous distinct clay films on rock fragments, between sand grains, on faces of peds; 20 percent gravel; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

Bt2—24 to 40 inches (61 to 102 cm); reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4), moist; 21 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky and slightly plastic; many very fine roots; many very fine and fine tubular pores; common continuous distinct clay films on rock fragments and on faces of peds; 10 percent gravel; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

2Bt—40 to 60 inches (102 to 152 cm); yellowish red (5YR 5/6) gravelly coarse sand, reddish brown (5YR 5/4), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and few medium roots; many very fine interstitial pores; few continuous distinct clay bridges between sand grains; 30 percent gravel; noneffervescent; neutral, pH 7.2.

### Range in Characteristics

Rock fragments: 5 to 30 percent  
 Reaction: 6.6 to 8.4 (neutral to moderately alkaline)

Average clay content in the control section: 18 to 35 percent

A horizon

Hue: 7.5YR, 5YR  
 Value: 4 to 6 dry, 3 to 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: loamy sand, sandy loam

Bt horizons

Hue: 2.5YR, 5YR  
 Value: 3 to 6, dry or moist  
 Chroma: 3 to 6, dry or moist  
 Texture: sandy clay loam, sandy loam

2Bt horizon

Hue: 2.5YR, 5 YR  
 Value: 4 to 6, dry or moist  
 Chroma: 4 to 6, dry or moist  
 Texture: coarse sand  
 Calcium carbonate equivalent: 0 to 10 percent

**Sasabe soils**

*Taxonomic classification:* Fine, mixed, superactive, thermic Ustic Paleargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*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:  
 • gravel: 5 percent  
 • cobble: 5 percent

*Depth to restrictive feature(s):* 3 to 15 inches to abrupt textural change

*Drainage class:* well drained

*Ksat solum:* 0.06 to 39.69 inches per hour (0.42 to 280.00 micrometers per second)

*Available water capacity total inches:* 7.1 (high)

*Shrink-swell potential:* about 7.5 LEP (high)

*Flooding hazard:* none

*Runoff class:* medium

*Hydrologic group:* C

*Ecological site name:* Loamy Upland 12-16" p.z.

*Ecological site number:* R041XC313AZ

*Present vegetation:* annual grasses, false mesquite, mesquite, sideoats grama, Rothrock's grama, feather fingergrass, tobosa, black grama, tanglehead

*Land capability (nonirrigated):* 6c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—Benson; about 850 feet north and 1,200 feet west of the southeast corner of section 18, Township 17 south, Range 20 east  
*Geographic Coordinate System:* 31° 57' 5.20" north, 110° 20' 8.80" west

A—0 to 3 inches (0 to 8 cm); reddish brown (5YR 4/4) coarse sand, dark reddish brown (5YR 3/4), moist; 4 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; 10 percent gravel; noneffervescent; slightly acid, pH 6.2; abrupt smooth boundary.

Bt1—3 to 18 inches (8 to 46 cm); reddish brown (2.5YR 4/4) gravelly sandy clay, red (2.5YR 4/6), moist; 47 percent clay; strong medium and coarse angular blocky structure; extremely hard, very firm, very sticky and very plastic; common very fine and fine roots; many very fine and fine interstitial pores; common continuous distinct organic stains on faces of peds; many continuous distinct clay films on rock fragments and on faces of peds; 20 percent gravel; noneffervescent; slightly acid, pH 6.4; clear smooth boundary.

Bt2—18 to 46 inches (46 to 117 cm); 50 percent reddish brown (2.5YR 4/4) and 50 percent reddish brown (2.5YR 5/4) gravelly clay, red (2.5YR 4/6), moist; 51 percent clay; strong fine and medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; common very fine and fine roots; many very fine and fine interstitial pores; common continuous distinct organic stains on faces of peds; many continuous distinct clay films on rock fragments and on faces of peds; 25 percent gravel; noneffervescent; neutral, pH 6.6; clear smooth boundary.

Bt3—46 to 60 inches (117 to 152 cm); reddish brown (2.5YR 4/4) sandy clay, red (2.5YR 4/6), moist; 41 percent clay; moderate fine and medium subangular blocky structure; soft, very friable, moderately sticky and slightly plastic; common very fine and fine roots; many very fine and fine interstitial pores; many continuous distinct clay films on rock fragments and on faces of peds; 10 percent gravel; noneffervescent; neutral, pH 7.0.

## Range in Characteristics

Rock fragments: 5 to 25 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average clay content in the control section: 35 to 60 percent

### A horizon

Hue: 7.5YR, 5YR

Value: 3 to 5, dry or moist

Chroma: 4 to 8, dry or moist

Texture: sandy loam, silt loam, fine sandy loam, coarse sand

### Bt horizons

Hue: 2.5YR, 5YR

Value: 3 to 5, dry or moist

Chroma: 3 to 6, dry or moist

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

### Diaspar soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Ustic Haplargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*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: 80 percent

Woody debris: 0 percent

Bare soil: 20 percent

Rock fragments: 0 percent

*Drainage class:* well drained*Ksat solum:* 1.98 to 39.69 inches per hour (14.00 to 280.00 micrometers per second)*Available water capacity total inches:* 4.1 (low)*Shrink-swell potential:* about 1.5 LEP (low)*Flooding hazard:* none*Runoff class:* low*Hydrologic group:* B*Ecological site name:* Sandy Loam Upland 12-16" p.z.*Ecological site number:* R041XC319AZ*Present vegetation:* annual grasses, false mesquite, black grama, mesquite, sideoats grama, Rothrock's grama, feather fingergrass, tanglehead*Land capability (nonirrigated):* 6c**Typical Profile***Location**Public Land Survey:* USGS Quadrangle—Benson; about 10 feet north and 500 feet west of the southeast corner of section 18, Township 17 south, Range 20 east*Geographic Coordinate System:* 31° 56' 24.70" north, 110° 20' 1.30" west

A—0 to 5 inches (0 to 13 cm); reddish brown (5YR 4/4) gravelly coarse sand, dark reddish brown (5YR 3/4), moist; 4 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; 25 percent gravel; noneffervescent; slightly acid, pH 6.2; abrupt smooth boundary.

Bt1—5 to 18 inches (13 to 46 cm); reddish brown (5YR 4/4) gravelly coarse sandy loam, dark reddish brown (5YR 3/4), moist; 11 percent clay; moderate fine and medium subangular blocky structure; hard, friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine and fine interstitial pores; many continuous distinct clay bridges between sand grains; many continuous distinct clay films on rock fragments and on faces of peds; 25 percent gravel; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

Bt2—18 to 40 inches (46 to 102 cm); brown (7.5YR 5/4) gravelly coarse sandy loam, brown (7.5YR 4/4), moist; 9 percent clay; strong fine and medium subangular blocky structure; hard, firm, slightly sticky and nonplastic; many very fine and fine and few medium roots; many very fine and fine interstitial pores; common continuous distinct clay bridges between sand grains; many continuous distinct clay films on rock fragments; 25 percent gravel; noneffervescent; neutral, pH 7.0; clear smooth boundary.

2Btk—40 to 60 inches (102 to 152 cm); brown (7.5YR 5/4) gravelly coarse sand, brown (7.5YR 4/4), moist; 4 percent clay; massive; hard, firm, nonsticky and

nonplastic; many very fine and fine and medium roots; many very fine and fine irregular pores; common continuous faint clay bridges between sand grains; common continuous distinct carbonate coats on rock fragments; 20 percent gravel and 10 percent cobble; noneffervescent; moderately alkaline, pH 8.4.

### Range in Characteristics

Rock fragments: 10 to 35 percent

Average clay content in the control section: 7 to 18 percent

#### A horizon

Hue: 7.5YR, 5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 4 or 6, dry or moist

Texture: coarse sand, sandy loam

Reaction: 6.1 to 7.3 (slightly acid to neutral)

#### Bt horizons

Hue: 2.5YR, 5YR, 7.5YR

Value: 3 to 5, dry or moist

Chroma: 3 to 6, dry or moist

Texture: sandy loam, coarse sandy loam

Reaction: 6.6 to 7.8 (neutral to slightly alkaline)

Calcium carbonate equivalent: 0 to 5 percent

#### 2Btk horizon

Hue: 2.5YR, 5YR

Value: 3 to 5, dry or moist

Chroma: 3 to 6, dry or moist

Texture: coarse sand, sandy loam

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Calcium carbonate equivalent: 0 to 5 percent

## 36—Deloro-Andrada complex, 5 to 35 percent slopes

### Map Unit Setting

*Landform(s):* mountains

*Elevation:* 3,800 to 4,800 feet (1,158 to 1,463 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Deloro and similar soils: 40 percent

Andrada and similar soils: 30 percent

Minor components: Riverwash, Lampshire, Rock outcrop, Chiricahua

### Soil Properties and Qualities

#### Deloro soils

*Taxonomic classification:* Clayey-skeletal, mixed, superactive, thermic, shallow Ustic Haplargids

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* alluvium and residuum from quartzite

*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: 40 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

- gravel: 45 percent

- cobble: 35 percent

- stone: 5 percent

*Depth to restrictive feature(s):* 12 to 20 inches to bedrock, paralithic

*Drainage class:* well drained

*Ksat solum:* 0.06 to 1.98 inches per hour (0.42 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:* 1.4 (very low)

*Shrink-swell potential:* about 7.5 LEP (high)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* C

*Ecological site name:* Volcanic Hills 12-16" p.z. Loamy

*Ecological site number:* R041XC323AZ

*Present vegetation:* sideoats grama, pale wolfberry, curly mesquite, slender grama, sprucetop grama, black grama, cane beardgrass, false mesquite, hairy grama, threawn, vine mesquite

*Land capability (nonirrigated):* 6c

## Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—Soza Mesa Quad; about 1,300 feet west and 400 feet north of the southeast corner of section 21, Township 12 south, Range 20 east

*Geographic Coordinate System:* 32° 22' 8.90" north, 110° 18' 28.50" west

A—0 to 2 inches (0 to 5 cm); dark reddish brown (5YR 3/3) very gravelly loam, dark reddish brown (5YR 3/3), moist; 21 percent clay; moderate medium and thick platy structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine tubular pores; 30 percent gravel and 10 percent cobble; noneffervescent; slightly alkaline, pH 7.4; abrupt wavy boundary.

Bt1—2 to 6 inches (5 to 15 cm); dark reddish brown (5YR 3/3) very gravelly sandy clay, dark reddish brown (5YR 3/3), moist; 35 percent clay; strong fine and medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common fine and medium roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; 40 percent gravel and 10 percent cobble; noneffervescent; neutral, pH 6.6; abrupt wavy boundary.

Bt2—6 to 17 inches (15 to 43 cm); dark reddish brown (2.5YR 3/4) very gravelly clay, dark red (2.5YR 3/6), moist; 50 percent clay; strong fine and medium subangular blocky structure; extremely hard, firm, very sticky and very plastic; many very fine and fine and few medium roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; 40 percent gravel and 15 percent cobble; noneffervescent; neutral, pH 6.8; abrupt wavy boundary.

2Crt—17 to 60 inches (43 to 152 cm); many continuous distinct clay films on fractures; weathered quartzite bedrock.

### Range in Characteristics

Rock fragments: 40 to 75 percent

Reaction: 6.6 to 7.8 (neutral to slightly alkaline)

Average percentage of clay in control section: 35 to 50 percent

#### A horizon

Hue: 7.5YR, 5YR

Value: 3 to 5 dry, 3 or 4 moist

Chroma: 2 to 4, dry or moist

Texture: loam, clay loam

#### Bt horizons

Hue: 2.5YR, 5YR

Value: 3 to 6 dry, 3 or 4 moist

Chroma: 2 to 6, dry or moist

Texture: clay, clay loam, sandy clay

### Andrada soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic, shallow Ustic Haplocalcids

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* alluvium and residuum from quartzite

*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: 40 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

- gravel: 55 percent
- cobble: 20 percent
- stone: 5 percent

*Depth to restrictive feature(s):* 10 to 20 inches to bedrock, paralithic

*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 4.5 LEP (moderate)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* C

*Ecological site name:* Limy Slopes 12-16" p.z.

*Ecological site number:* R041XC308AZ

*Present vegetation:* sideoats grama, black grama, wolftail, cane beardgrass, curly mesquite, desert zinnia, range ratany, shinedaggar

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Soza Mesa; about 1,400 feet north and 1,200 feet east of the southwest corner of section 22, Township 12 south, Range 20 east

*Geographic Coordinate System:* 32° 22' 16.50" north, 110° 17' 53.70" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/3) extremely gravelly loam, dark brown (7.5YR 3/3), moist; 20 percent clay; moderate medium and thick platy parting to weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; 50 percent gravel and 20 percent cobble; strongly effervescent, 18 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Bk—2 to 15 inches (5 to 38 cm); brown (7.5YR 5/2) very gravelly sandy clay loam, brown (7.5YR 4/2), moist; 27 percent clay; weak very fine subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; many fine and medium and common coarse roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; 40 percent gravel and 15 percent cobble; violently effervescent, 25 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt wavy boundary.

2Crk—15 to 60 inches (38 to 152 cm); many continuous distinct carbonate coats on fractures; weathered quartzite bedrock.

### Range in Characteristics

Rock fragments: 35 to 80 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 15 to 30 percent

Calcium carbonate equivalent: 10 to 30 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 2 to 4, dry or moist

Texture: loam, sandy loam

#### Bk horizon

Hue: 10YR, 7.5YR

Value: 3 to 8 dry, 3 to 7 moist

Chroma: 2 to 4, dry or moist

Texture: loam, sandy clay loam

### 37—Denied Access

This map unit is in areas where landowners refused access to their private property. The owners of private property are entitled to this right. These areas were not traversed; therefore, soils information will not be provided. The National Soil Survey Handbook requires that every area on a soil map be designated with a map unit number. It also requires that every means available to the soil survey project be used to obtain access. This responsibility was carried out with the help of the Natural Resource Conservation Districts, but access was still denied.

### 38—Durazo coarse sand, 1 to 5 percent slopes

#### Map Unit Setting

*Landform(s):* alluvial fans

*Elevation:* 3,900 to 4,500 feet (1,189 to 1,372 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

#### Map Unit Composition

Durazo and similar soils: 80 percent

Minor components: Bodecker, Riverwash

#### Soil Properties and Qualities

##### Durazo soils

*Taxonomic classification:* Mixed, thermic Ustic Torripsamments

*Geomorphic position:* inset between terraces and pediments

*Parent material:* mixed alluvium

*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: 50 percent

    Woody debris: 10 percent

    Bare soil: 40 percent

    Rock fragments:

        • gravel: 10 percent

*Drainage class:* excessively drained

*Ksat solum:* 1.98 to 39.69 inches per hour (14.00 to 280.00 micrometers per second)

*Available water capacity total inches:* 4.7 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* rare

*Runoff class:* very low

*Hydrologic group:* A

*Ecological site name:* Sandy Loam 12-16" p.z. Deep

*Ecological site number:* R041XC318AZ

*Present vegetation:* mesquite, catclaw acacia, bush muhly, burroweed, perennial forbs, pricklypear, cholla, soap tree yucca, fishhook barrel cactus, graythorn

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 2,000 feet east and 2,000 feet south of the northwest corner of section 35, Township 14 south, Range 20 east

*Geographic Coordinate System:* 32° 10' 29.00" north, 110° 16' 19.00" west

A—0 to 9 inches (0 to 23 cm); brown (7.5YR 5/4) coarse sand, brown (7.5YR 4/3), moist; 3 percent clay; weak very fine granular structure; loose, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores; 10 percent gravel; noneffervescent; neutral, pH 7.2; abrupt smooth boundary.

C—9 to 36 inches (23 to 91 cm); brown (7.5YR 4/2) loamy coarse sand, dark brown (7.5YR 3/2), moist; 4 percent clay; massive; soft, very friable, nonsticky and nonplastic; common medium and few coarse roots; many very fine interstitial pores; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

2Btb—36 to 60 inches (91 to 152 cm); reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4), moist; 10 percent clay; moderate very fine and fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; many medium roots; many very fine interstitial pores; common continuous distinct clay films between sand grains and on rock fragments; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.4.

### Range in Characteristics

Rock fragments: 0 to 10 percent

Reaction: 6.6 to 7.8 (neutral to slightly alkaline)

#### A and C horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 2 to 4, dry or moist

Texture: coarse sand, loamy sand, loamy coarse sand

Clay content: 3 to 15 percent

#### 2Btb horizon

Hue: 5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam

Clay content: 5 to 15 percent

## 39—Eloma-Caralampi-White House complex, 1 to 15 percent slopes

### Map Unit Setting

*Landform(s):* fan terraces

*Elevation:* 4,200 to 4,800 feet (1,280 to 1,463 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)  
*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)  
*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)  
*Frost-free period:* 180 to 230 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Eloma and similar soils: 40 percent  
 Caralampi and similar soils: 30 percent  
 White House and similar soils: 20 percent  
 Minor components: Keysto, Pedregosa, Elgin, Nolam

### Soil Properties and Qualities

#### Eloma soils

*Taxonomic classification:* Clayey-skeletal, mixed, superactive, thermic Ustic  
 Haplargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*Slope:* 1 to 15 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 45 percent

Woody debris: 5 percent

Bare soil: 15 percent

Rock fragments:

- gravel: 25 percent

- cobble: 20 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:* 4.1 (low)

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* none

*Runoff class:* medium

*Hydrologic group:* C

*Ecological site name:* Clay Loam Upland 12-16" p.z.

*Ecological site number:* R041XC305AZ

*Present vegetation:* tobosa, cane beardgrass, sideoats grama, plains lovegrass, blue grama, curly mesquite, false mesquite, obtuse panicgrass, sprucetop grama

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Arizona, Douglas-Tombstone Part; USGS Quadrangle—Huachuca City; in an unsectionalized area, Township 20 south, Range 19 east

*Geographic Coordinate System:* 31° 38' 30.00" north, 110° 21' 30.00" west

A—0 to 1 inch (0 to 3 cm); dark reddish brown (5YR 3/3) very gravelly sandy loam, dark reddish brown (5YR 2.5/2), moist; 12 percent clay; weak fine granular structure; soft, very friable, nonsticky and nonplastic; few fine roots; few fine interstitial pores; 35 percent gravel and 5 percent cobble; noneffervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

Bt1—1 to 10 inches (3 to 25 cm); dark reddish brown (5YR 3/3) very gravelly clay loam, dark reddish brown (5YR 2.5/2), moist; 35 percent clay; moderate fine subangular blocky structure; hard, firm, moderately sticky and very plastic; many very fine and fine roots; few fine tubular pores; many continuous distinct clay films on faces of peds, on rock fragments, and on surfaces along pores; 50 percent gravel; noneffervescent; neutral, pH 7.2; abrupt smooth boundary.

Bt2—10 to 27 inches (25 to 69 cm); dark reddish brown (2.5YR 3/4) very gravelly clay, dark reddish brown (2.5YR 2.5/4), moist; 45 percent clay; moderate fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; many very fine and fine roots; few fine tubular pores; many continuous distinct clay films on faces of peds, on rock fragments, and on surfaces along pores; 50 percent gravel and 5 percent cobble; noneffervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

Bt3—27 to 60 inches (69 to 152 cm); dark reddish brown (2.5YR 3/4) extremely cobbly clay, dark reddish brown (2.5YR 2.5/4), moist; 45 percent clay; strong fine and medium angular blocky structure; hard, firm, very sticky and very plastic; many very fine and fine roots; few fine tubular pores; many continuous distinct clay films on faces of peds, on rock fragments, and on surfaces along pores; 35 percent gravel and 30 percent cobble; noneffervescent; neutral, pH 7.2.

### **Range in Characteristics**

Rock fragments: 35 to 65 percent

Reaction: 6.6 to 7.8 (neutral to slightly alkaline)

Average clay content in control section: 35 to 60 percent

#### **A horizon**

Hue: 7.5YR, 5YR

Value: 3 to 5 dry, 2.5 to 4 moist

Chroma: 2 to 4, dry or moist

Texture: sandy loam, loam

#### **Bt horizons**

Hue: 2.5YR, 5YR

Value: 3 or 4 dry, 2.5 to 4 moist

Chroma: 2 to 6, dry or moist

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

### **Caralampi soils**

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Ustic

Haplargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*Slope:* 1 to 15 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

**Chemical crust**

Salt: 0 percent

Gypsum: 0 percent

**Physical cover**

Canopy plant cover: 50 percent

Woody debris: 5 percent

Bare soil: 15 percent

Rock fragments:

• gravel: 50 percent

• cobble: 20 percent

*Drainage class:* well drained*Ksat solum:* 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)*Available water capacity total inches:* 6.5 (moderate)*Shrink-swell potential:* about 1.5 LEP (low)*Flooding hazard:* none*Runoff class:* medium*Hydrologic group:* B*Ecological site name:* Loamy Upland 12-16" p.z.*Ecological site number:* R041XC313AZ*Present vegetation:* cane beardgrass, sideoats grama, black grama, blue grama, plains lovegrass, curly mesquite, false mesquite, littleleaf ratany, sprucetop grama*Land capability (nonirrigated):* 6c**Typical Profile***Location**Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Arizona, Douglas-Tombstone Part; USGS Quadrangle—Huachuca City; in an unsectionalized area, Township 20 south, Range 19 east*Geographic Coordinate System:* 31° 38' 47.00" north, 110° 21' 21.00" west

A—0 to 1 inch (0 to 3 cm); reddish brown (5YR 4/4) sandy loam, dark reddish brown (5YR 3/4), moist; 12 percent clay; moderate thin platy structure; soft, very friable, nonsticky and slightly plastic; many very fine and fine roots; common fine irregular pores; 5 percent gravel; noneffervescent; slightly acid, pH 6.2; abrupt smooth boundary.

Bt1—1 to 12 inches (3 to 30 cm); dark reddish brown (2.5YR 3/4) gravelly clay loam, dark reddish brown (2.5YR 3/3), moist; 35 percent clay; moderate very fine subangular blocky structure; slightly hard, firm, moderately sticky and moderately plastic; many very fine and fine roots; few fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; 25 percent gravel and 5 percent cobble; noneffervescent; slightly acid, pH 6.4; clear wavy boundary.

Bt2—12 to 50 inches (30 to 127 cm); dark reddish brown (2.5YR 3/4) very gravelly clay loam, dark reddish brown (2.5YR 3/4), moist; 35 percent clay; moderate very fine subangular blocky structure; hard, firm, moderately sticky and moderately plastic; common very fine roots; few fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; 30 percent gravel and 15 percent cobble; noneffervescent; slightly acid, pH 6.2; abrupt smooth boundary.

Bk—50 to 60 inches (127 to 152 cm); reddish brown (5YR 4/4) very gravelly coarse sandy loam, yellowish red (5YR 4/6), moist; 10 percent clay; massive; hard, friable, nonsticky and nonplastic; few very fine roots; few fine tubular pores; many continuous distinct carbonate coats on rock fragments; 45 percent gravel and 5 percent cobble;

strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 25 to 65 percent, averages more than 35 percent

Average clay content in control section: 18 to 35 percent

#### A horizon

Hue: 7.5YR, 5YR

Value: 3 to 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: fine sandy loam, sandy loam

Reaction: 6.1 to 7.3 (slightly acid to neutral)

#### Bt horizons

Hue: 2.5YR, 5YR

Value: 3 or 4, dry or moist

Chroma: 3 or 4 dry, 3 to 6 moist

Texture: sandy clay loam, clay loam

Reaction: 6.1 to 7.3 (slightly acid to neutral)

#### Bk horizon

Hue: 5YR

Value: 3 or 4, dry or moist

Chroma: 4 to 6, dry or moist

Texture: coarse sandy loam, sandy loam

Reaction: 6.6 to 8.0 (neutral to moderately alkaline)

Calcium carbonate equivalent: 0 to 10 percent below 40 inches

### White House soils

*Taxonomic classification:* Fine, mixed, superactive, thermic Ustic Haplargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*Slope:* 1 to 15 percent

#### *Surface cover:*

##### Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

##### Chemical crust

Salt: 0 percent

Gypsum: 0 percent

##### Physical cover

Canopy plant cover: 40 percent

Woody debris: 5 percent

Bare soil: 60 percent

Rock fragments:

- gravel: 3 percent

- cobble: 1 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:* 6.1 (moderate)

*Shrink-swell potential:* about 7.5 LEP (high)

*Flooding hazard:* none

*Runoff class:* medium

*Hydrologic group:* C

*Ecological site name:* Loamy Upland 12-16" p.z.

*Ecological site number:* R041XC313AZ

*Present vegetation:* cane beardgrass, sideoats grama, blue grama, plains lovegrass, curly mesquite, false mesquite, sprucetop grama

*Land capability (nonirrigated):* 6c

### Typical Profile

#### *Location*

*Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Arizona, Douglas-Tombstone Part; USGS Quadrangle—Huachuca City; in an unsectionalized area, Township 20 south, Range 19 east

*Geographic Coordinate System:* 31° 38' 42.90" north, 110° 21' 58.93" west

A—0 to 1 inch (0 to 3 cm); brown (7.5YR 4/3) sandy loam, dark brown (7.5YR 3/3), moist; 12 percent clay; moderate coarse platy structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; many fine irregular pores; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

A/B—1 to 5 inches (3 to 13 cm); brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 3/3), moist; 26 percent clay; weak medium subangular blocky structure; slightly hard, very friable, moderately sticky and moderately plastic; many very fine roots; common fine tubular pores; few prominent clay bridges between sand grains; noneffervescent; neutral, pH 6.6; abrupt wavy boundary.

Bt—5 to 35 inches (13 to 89 cm); red (2.5YR 4/6) clay, dark reddish brown (2.5YR 3/4), moist; 45 percent clay; strong fine and medium angular blocky structure; hard, firm, very sticky and very plastic; common very fine roots; few fine tubular pores; many continuous prominent clay films on faces of peds and between sand grains; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

2Btkb—35 to 60 inches (89 to 152 cm); dark red (2.5YR 3/6) extremely gravelly clay, dark reddish brown (2.5YR 3/4), moist; 45 percent clay; weak fine subangular blocky structure; hard, firm, very sticky and very plastic; few fine roots; few fine tubular pores; common continuous distinct clay films on faces of peds and on rock fragments; few fine carbonate filaments; 55 percent gravel and 5 percent cobble; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Average clay content in the control section: 35 to 60 percent

#### A and A/B horizons

Hue: 2.5YR, 5YR, 7.5YR  
 Value: 3 or 4, dry or moist  
 Chroma: 3 or 4, dry or moist  
 Texture: sandy loam, sandy clay loam  
 Reaction: 6.6 to 7.3 (neutral)  
 Rock fragments: 0 to 20 percent

#### Bt horizon

Hue: 2.5YR, 5YR  
 Value: 3 or 4, dry or moist  
 Chroma: 4 to 6, dry or moist  
 Texture: clay loam, clay, sandy clay loam  
 Reaction: 6.6 to 7.3 (neutral)  
 Rock fragments: 0 to 20 percent

**2Btkb horizon**

Hue: 2.5YR, 5YR  
 Value: 3 to 5, dry or moist  
 Chroma: 4 to 8, dry or moist  
 Texture: clay loam, clay  
 Reaction: 6.6 to 8.4 (neutral to moderately alkaline)  
 Rock fragments: 50 to 70 percent  
 Calcium carbonate equivalent: 0 to 15 percent

## **40—Gila-Glendale complex, Chihuahuan, 0 to 2 percent slopes**

### **Map Unit Setting**

*Landform(s):* flood plains  
*Elevation:* 3,000 to 3,600 feet (914 to 1,097 meters)  
*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)  
*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)  
*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)  
*Frost-free period:* 190 to 260 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### **Map Unit Composition**

Gila, Chihuahuan, and similar soils: 45 percent  
 Glendale, Chihuahuan, and similar soils: 35 percent  
 Minor components: Hantz, Anthony

### **Soil Properties and Qualities**

#### **Gila, Chihuahuan soils**

*Taxonomic classification:* Coarse-loamy, mixed, superactive, calcareous, thermic  
 Typic Torrfluvents  
*Geomorphic position:* dissected by erosional channels  
*Parent material:* mixed stream alluvium  
*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: 90 percent  
 Woody debris: 5 percent  
 Bare soil: 5 percent  
 Rock fragments: 0 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:* 10.2 (very high)  
*Shrink-swell potential:* about 1.0 LEP (low)

*Flooding hazard:* occasional

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Prosopis glandulosa var. torreyana-Prosopis velutina/  
Sporobolus wrightii

*Ecological site number:* F041XB221AZ

*Present vegetation:* mesquite, catclaw acacia, annual grasses, bush muhly, plains  
bristlegrass

*Land capability (irrigated):* 3e

*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 2,250 feet west and 400 feet south of northeast corner of section 6, Township 16 south, Range 20 east

*Geographic Coordinate System:* 32° 4' 42.00" north, 110° 20' 24.00" west

Ap1—0 to 3 inches (0 to 8 cm); brown (10YR 5/3) very fine sandy loam, brown (10YR 4/3), moist; 10 percent clay; single grain; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Ap2—3 to 18 inches (8 to 46 cm); brown (10YR 5/3) very fine sandy loam, brown (10YR 4/3), moist; 10 percent clay; massive; soft, very friable, nonsticky and slightly plastic; many very fine roots; many very fine tubular and interstitial pores; violently effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

C'—18 to 36 inches (46 to 91 cm); brown (10YR 5/3) silt loam, very dark brown (10YR 2/2), moist; 15 percent clay; moderate fine and medium subangular blocky structure; slightly hard, firm, nonsticky and slightly plastic; many very fine roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Ck—36 to 50 inches (91 to 127 cm); brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2), moist; 15 percent clay; massive; slightly hard, firm, nonsticky and slightly plastic; few very fine roots; many very fine and fine tubular pores; common fine carbonate masses; violently effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C"—50 to 60 inches (127 to 152 cm); brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3), moist; 10 percent clay; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; common very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.0.

### Range in Characteristics

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 5 to 18 percent

#### A horizons

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 to 4, dry or moist

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

#### C horizons

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 2 to 4 moist

Chroma: 2 to 4, dry or moist

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

### **Glendale, Chihuahuan soils**

*Taxonomic classification:* Fine-silty, mixed, superactive, calcareous, thermic Typic Torrifuvents

*Geomorphic position:* dissected by erosional channels

*Parent material:* mixed stream alluvium

*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: 90 percent

Woody debris: 5 percent

Bare soil: 5 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:* 9.8 (high)

*Shrink-swell potential:* about 4.0 LEP (moderate)

*Flooding hazard:* occasional

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Prosopis glandulosa var. torreyana-Prosopis velutina/

Sporobolus wrightii

*Ecological site number:* F041XB221AZ

*Present vegetation:* Engelmann's prickly pear, mesquite, annual grasses, bush muhly, catclaw acacia, graythorn, plains bristlegrass, spike dropseed, staghorn cholla

*Land capability (irrigated):* 3e

*Land capability (nonirrigated):* 7c

## **Typical Profile**

### *Location*

*Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 850 feet south and 750 feet west of northeast corner of section 6, Township 16 south, Range 20 east

*Geographic Coordinate System:* 32° 4' 42.00" north, 110° 20' 12.00" west

Ap1—0 to 1 inch (0 to 3 cm); brown (10YR 5/3) very fine sandy loam, very dark grayish brown (10YR 3/2), moist; 10 percent clay; weak thick platy parting to moderate medium cloddy structure; soft, very friable, nonsticky and slightly plastic; many very fine and fine and common medium roots; common fine tubular and vesicular pores; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Ap2—1 to 15 inches (3 to 38 cm); brown (10YR 5/3) very fine sandy loam, very dark grayish brown (10YR 3/2), moist; 10 percent clay; weak fine and medium subangular blocky parting to cloddy structure; soft, very friable, nonsticky and slightly plastic;

many very fine and common medium roots; many very fine and fine tubular pores; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Cky1—15 to 24 inches (38 to 61 cm); very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2), moist; 30 percent clay; moderate fine, medium, and coarse angular blocky structure; very hard, firm, moderately sticky and moderately plastic; common very fine roots; many very fine tubular pores; few distinct redox concentrations occurring as fine strong brown (7.5YR 5/8) iron masses infused into the matrix; common fine carbonate masses; common fine gypsum crystals; violently effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Cky2—24 to 48 inches (61 to 122 cm); brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2), moist; 30 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine and medium roots; many fine tubular pores; common fine carbonate masses; common fine gypsum crystals; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C—48 to 60 inches (122 to 152 cm); yellowish brown (10YR 5/4) sand, dark yellowish brown (10YR 4/4), moist; 3 percent clay; massive; soft, friable, nonsticky and nonplastic; few very fine roots; common fine interstitial and tubular pores; violently effervescent; moderately alkaline, pH 8.0.

### Range in Characteristics

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 18 to 35 percent

#### A horizons

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 2 to 4, dry or moist

Texture: clay loam, silty clay loam, very fine sandy loam, loam

#### C horizons

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 2 to 4, dry or moist

Texture: clay loam, silty clay loam, loam, sand

## 41—Gila-Glendale complex, Sonoran, 0 to 2 percent slopes

### Map Unit Setting

*Landform(s)*: flood plains

*Elevation*: 3,000 to 3,600 feet (914 to 1,097 meters)

*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature*: 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period*: 190 to 260 days

*Major Land Resource Area*: 40; Sonoran Basin and Range

*Land Resource Unit*: 40-1; Upper Sonoran Desert Shrub

### Map Unit Composition

Gila, Sonoran, and similar soils: 45 percent

Glendale, Sonoran, and similar soils: 35 percent

Minor components: Hantz, Anthony

### Soil Properties and Qualities

#### Gila, Sonoran soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, calcareous, thermic  
Typic Torrfluvents

*Geomorphic position:* dissected by erosional channels

*Parent material:* mixed stream alluvium

*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: 90 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments: 0 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:* 10.2 (very high)

*Shrink-swell potential:* about 1.0 LEP (low)

*Flooding hazard:* occasional

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Prosopis velutina/Sporobolus wrightii

*Ecological site number:* F040XA124AZ

*Present vegetation:* mesquite, catclaw acacia, annual grasses, bush muhly, plains  
bristlegrass

*Land capability (irrigated):* 3e

*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 2,250 feet west  
and 400 feet south of northeast corner of section 6, Township 16 south, Range 20  
east

*Geographic Coordinate System:* 32° 4' 42.00" north, 110° 20' 24.00" west

Ap1—0 to 3 inches (0 to 8 cm); brown (10YR 5/3) very fine sandy loam, brown (10YR  
4/3), moist; 10 percent clay; single grain; soft, very friable, nonsticky and nonplastic;  
many very fine roots; many very fine interstitial pores; violently effervescent;  
moderately alkaline, pH 8.0; abrupt smooth boundary.

Ap2—3 to 18 inches (8 to 46 cm); brown (10YR 5/3) very fine sandy loam, brown  
(10YR 4/3), moist; 10 percent clay; massive; soft, very friable, nonsticky and slightly  
plastic; many very fine roots; many very fine tubular and interstitial pores; violently  
effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

C'—18 to 36 inches (46 to 91 cm); brown (10YR 5/3) silt loam, very dark brown

(10YR 2/2), moist; 15 percent clay; moderate fine and medium subangular blocky structure; slightly hard, firm, nonsticky and slightly plastic; many very fine roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Ck2—36 to 50 inches (91 to 127 cm); brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2), moist; 15 percent clay; massive; slightly hard, firm, nonsticky and slightly plastic; few very fine roots; many very fine and fine tubular pores; common fine carbonate masses; violently effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C"—50 to 60 inches (127 to 152 cm); brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3), moist; 10 percent clay; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; common very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.0.

### Range in Characteristics

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 5 to 18 percent

#### A horizons

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 to 4, dry or moist

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

#### C horizons

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 2 to 4 moist

Chroma: 2 to 4, dry or moist

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

### Glendale, Sonoran soils

*Taxonomic classification:* Fine-silty, mixed, superactive, calcareous, thermic Typic

Torrifluvents

*Geomorphic position:* dissected by erosional channels

*Parent material:* mixed stream alluvium

*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: 90 percent

Woody debris: 5 percent

Bare soil: 5 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:* 9.8 (high)

*Shrink-swell potential:* about 4.0 LEP (moderate)

*Flooding hazard:* occasional

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Prosopis velutina/Sporobolus wrightii

*Ecological site number:* F040XA124AZ

*Present vegetation:* Engelmann's prickly pear, mesquite, annual grasses, bush muhly, catclaw acacia, graythorn, plains bristlegrass, spike dropseed, staghorn cholla

*Land capability (irrigated):* 3e

*Land capability (nonirrigated):* 7c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 850 feet south and 750 feet west of northeast corner of section 6, Township 16 south, Range 20 east

*Geographic Coordinate System:* 32° 4' 42.00" north, 110° 20' 12.00" west

Ap1—0 to 1 inch (0 to 3 cm); brown (10YR 5/3) very fine sandy loam, very dark grayish brown (10YR 3/2), moist; 10 percent clay; weak thick platy parting to moderate medium cloddy structure; soft, very friable, nonsticky and slightly plastic; many very fine and fine and common medium roots; common fine tubular and vesicular pores; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Ap2—1 to 15 inches (3 to 38 cm); brown (10YR 5/3) very fine sandy loam, very dark grayish brown (10YR 3/2), moist; 10 percent clay; weak fine and medium subangular blocky parting to cloddy structure; soft, very friable, nonsticky and slightly plastic; many very fine and common medium roots; many very fine and common fine tubular pores; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Cky1—15 to 24 inches (38 to 61 cm); very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2), moist; 30 percent clay; moderate fine and medium and coarse angular blocky structure; very hard, firm, moderately sticky and moderately plastic; common very fine roots; many very fine tubular pores; few distinct redox concentrations occurring as fine strong brown (7.5YR 5/8) iron masses infused into the matrix; common fine carbonate masses; common fine gypsum crystals; violently effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Cky2—24 to 48 inches (61 to 122 cm); brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2), moist; 30 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine and medium roots; many fine tubular pores; common fine carbonate masses and common fine gypsum crystals; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C—48 to 60 inches (122 to 152 cm); yellowish brown (10YR 5/4) sand, dark yellowish brown (10YR 4/4), moist; 3 percent clay; massive; soft, friable, nonsticky and nonplastic; few very fine roots; common fine interstitial and tubular pores; violently effervescent; moderately alkaline, pH 8.0.

## Range in Characteristics

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 18 to 35 percent

### A horizons

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 2 to 4, dry or moist

Texture: clay loam, silty clay loam, very fine sandy loam, loam

## C horizons

Hue: 7.5YR, 10YR  
 Value: 3 to 5 dry, 2 to 4 moist  
 Chroma: 2 to 4, dry or moist  
 Texture: clay loam, silty clay loam, loam, sand

**42—Glendale silty clay loam, 0 to 1 percent slopes****Map Unit Setting**

*Landform(s)*: flood plains  
*Elevation*: 2,900 to 3,800 feet (884 to 1,158 meters)  
*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)  
*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)  
*Mean annual soil temperature*: 64 to 70 degrees F (17.8 to 21.1 degrees C)  
*Frost-free period*: 190 to 260 days  
*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range  
*Land Resource Unit*: 41-2; Chihuahuan-Sonoran Desert Shrub Mix

**Map Unit Composition**

Glendale and similar soils: 80 percent  
 Minor components: Hantz, Gila, Contention, Whitecliff

**Soil Properties and Qualities****Glendale soils**

*Taxonomic classification*: Fine-silty, mixed, superactive, calcareous, thermic Typic  
 Torrfluvents  
*Geomorphic position*: dissected by erosional channels  
*Parent material*: mixed stream alluvium  
*Slope*: 0 to 1 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 39.69 inches per hour (1.40 to 280.00 micrometers per second)  
*Available water capacity total inches*: 10.5 (very high)  
*Shrink-swell potential*: about 4.5 LEP (moderate)  
*Flooding hazard*: occasional  
*Runoff class*: low  
*Hydrologic group*: B  
*Ecological site name*: Loamy Swales 8-12" p.z.  
*Ecological site number*: R041XB209AZ

*Present vegetation:* mesquite, bush muhly, catclaw acacia, graythorn, plains  
bristleglass, annual grasses

*Land capability (irrigated):* 3w

*Land capability (nonirrigated):* 7c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 700 feet west and 1,000 feet south of the northeast corner of section 32, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 5' 45.00" north, 110° 18' 30.00" west

A—0 to 8 inches (0 to 20 cm); pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3), moist; 31 percent clay; weak medium granular structure; hard, friable, moderately sticky and moderately plastic; many very fine and fine roots; few fine interstitial pores; 10 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C1—8 to 16 inches (20 to 41 cm); grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2), moist; 35 percent clay; massive; hard, friable, moderately sticky and moderately plastic; common very fine and fine roots; few fine tubular pores; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C2—16 to 22 inches (41 to 56 cm); grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2), moist; 35 percent clay; massive; hard, friable, moderately sticky and moderately plastic; common fine and medium roots; few fine tubular pores; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C3—22 to 40 inches (56 to 102 cm); light gray (10YR 7/2) silty clay loam, brown (10YR 5/3), moist; 35 percent clay; massive; hard, friable, moderately sticky and moderately plastic; few fine roots; few fine tubular pores; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Cn1—40 to 45 inches (102 to 114 cm); light brownish gray (10YR 6/2) coarse sand, dark brown (10YR 3/3), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; few fine roots; few fine interstitial pores; strongly effervescent; strongly alkaline, pH 8.8; abrupt smooth boundary.

Cn2—45 to 60 inches (114 to 152 cm); pale brown (10YR 6/3) very fine sandy loam, brown (10YR 4/3), moist; 12 percent clay; massive; slightly hard, very friable, slightly sticky and moderately plastic; few fine roots; few fine tubular pores; strongly effervescent; strongly alkaline, pH 8.8.

### Range in Characteristics

Rock fragments: 0 to 10 percent

Reaction: 7.9 to 9.0 (moderately to strongly alkaline)

Average clay content in the control section: 18 to 35 percent

#### A horizon

Hue: 10YR

Value: 5 to 7 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: silty clay loam, loam, silt loam

#### C horizons

Hue: 7.5YR, 10YR

Value: 5 to 7 dry, 3 to 6 moist  
 Chroma: 2 or 4 dry or moist  
 Texture: silty clay loam, silt loam, strata that are both coarser and finer

### **43—Glendale-Hantz complex, Chihuahuan, 0 to 3 percent slopes**

#### **Map Unit Setting**

*Landform(s)*: flood plains  
*Elevation*: 2,900 to 3,600 feet (884 to 1,098 meters)  
*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)  
*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)  
*Mean annual soil temperature*: 64 to 70 degrees F (17.8 to 21.1 degrees C)  
*Frost-free period*: 190 to 260 days  
*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range  
*Land Resource Unit*: 41-2; Chihuahuan-Sonoran Desert Shrub Mix

#### **Map Unit Composition**

Glendale, Chihuahuan, and similar soils: 55 percent  
 Hantz, Chihuahuan, and similar soils: 40 percent  
 Minor components: Gila, Vinton, Anthony, Contention

#### **Soil Properties and Qualities**

##### **Glendale, Chihuahuan soils**

*Taxonomic classification*: Fine-silty, mixed, superactive, calcareous, thermic Typic Torrfluvents  
*Geomorphic position*: dissected by erosional channels  
*Parent material*: mixed stream alluvium  
*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: 90 percent  
     Woody debris: 5 percent  
     Bare soil: 5 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*: 11.2 (very high)  
*Shrink-swell potential*: about 1.5 LEP (low)  
*Flooding hazard*: occasional  
*Runoff class*: low  
*Hydrologic group*: B  
*Ecological site name*: Prosopis glandulosa var. torreyana-Prosopis velutina/  
   Sporobolus wrightii  
*Ecological site number*: F041XB221AZ

*Present vegetation:* mesquite, bush muhly, catclaw acacia, graythorn, plains  
bristleglass, spike dropseed, annual grasses

*Land capability (irrigated):* 3w

*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Soza Canyon; about 2,500 feet south and 1,150 feet west of the northeast corner of section 32, Township 12 south, Range 19 east

*Geographic Coordinate System:* 32° 20' 50.00" north, 110° 25' 15.00" west

C1—0 to 4 inches (0 to 10 cm); dark brown (7.5YR 3/3) loam, very dark brown (7.5YR 2.5/3), moist; 21 percent clay; weak thin platy parting to moderate fine granular structure; soft, very friable, moderately sticky and moderately plastic; many very fine and fine roots; many very fine and fine irregular pores; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C2—4 to 19 inches (10 to 48 cm); dark brown (7.5YR 3/3) silty clay loam, very dark brown (7.5YR 2.5/3), moist; 35 percent clay; moderate fine granular structure; slightly hard, friable, very sticky and very plastic; many fine and common medium roots; many very fine and fine irregular pores; violently effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

C3—19 to 25 inches (48 to 64 cm); brown (10YR 4/3) silt loam, dark brown (10YR 3/3), moist; 20 percent clay; massive; soft, very friable, moderately sticky and very plastic; common fine and few coarse roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C4—25 to 40 inches (64 to 102 cm); dark brown (7.5YR 3/3) silt loam, very dark brown (7.5YR 2.5/3), moist; 20 percent clay; weak fine and medium subangular blocky structure; soft, very friable, moderately sticky and very plastic; few fine and common medium and coarse roots; many very fine tubular pores; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C5—40 to 60 inches (102 to 152 cm); brown (10YR 4/3) silt loam, dark brown (10YR 3/3), moist; 20 percent clay; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and very plastic; common fine roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.2.

### Range in Characteristics

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 18 to 35 percent

#### C horizons

Hue: 7.5YR, 10YR

Value: 3 to 6 dry, 2.5 to 5 moist

Chroma: 2 to 4, dry or moist

Texture: silt loam, silty clay loam, loam

### Hantz, Chihuahuan soils

*Taxonomic classification:* Fine, mixed, superactive, calcareous, thermic Vertic  
Torrifluvents

*Geomorphic position:* dissected by erosional channels

*Parent material:* mixed stream alluvium

*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: 90 percent  
   Woody debris: 5 percent  
   Bare soil: 5 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:* 8.6 (high)  
*Shrink-swell potential:* about 7.5 LEP (high)  
*Flooding hazard:* occasional  
*Runoff class:* low  
*Hydrologic group:* C  
*Ecological site name:* Prosopis glandulosa var. torreyana-Prosopis velutina/  
   Sporobolus wrightii  
*Ecological site number:* F041XB221AZ  
*Present vegetation:* Mojave seablite, mesquite, alkali sacaton, annual grasses, false  
   Rhodesgrass, fourwing saltbush, wolfberry  
*Land capability (irrigated):* 3w  
*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Soza Canyon; about 1,900 feet and 1,600 feet west of the northeast corner of section 32, Township 12 south, Range 19 east  
*Geographic Coordinate System:* 32° 21' 0.00" north, 110° 25' 20.00" west

Ap—0 to 4 inches (0 to 10 cm); brown (7.5YR 4/4) clay loam, dark brown (7.5YR 3/4), moist; 35 percent clay; moderate very fine and fine cloddy structure; soft, very friable, very sticky and very plastic; many very fine and fine roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C1—4 to 10 inches (10 to 25 cm); brown (7.5YR 4/4) clay, dark brown (7.5YR 3/4), moist; 45 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, very sticky and very plastic; many very fine and fine roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C2—10 to 23 inches (25 to 58 cm); brown (7.5YR 4/3) clay, dark brown (7.5YR 3/3), moist; 45 percent clay; moderate very fine and fine subangular blocky structure; hard, friable, very sticky and very plastic; many very fine and fine and few medium roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C3—23 to 46 inches (58 to 117 cm); brown (10YR 4/3) silty clay, dark brown (10YR 3/3), moist; 45 percent clay; moderate fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; many very fine and fine and few medium roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

2C—46 to 60 inches (117 to 152 cm); brown (7.5YR 4/3) sandy loam, dark brown

(7.5YR 3/3), moist; 15 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine and few medium roots; common fine tubular pores; violently effervescent; moderately alkaline, pH 8.2.

### Range in Characteristics

Soil cracking: many vertical cracks 0.25 inch to 3 inches wide from the surface to a depth of 27 inches

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 35 to 60 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

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

#### C horizons

Hue: 7.5YR, 10YR

Value: 3 to 6 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

Texture: silty clay loam, silty clay, clay

Some pedons contain strata of coarser material below 40 inches.

## 44—Glendale-Hantz complex, Sonoran, 0 to 3 percent slopes

### Map Unit Setting

*Landform(s)*: flood plains

*Elevation*: 2,900 to 3,600 feet (884 to 1,098 meters)

*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature*: 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period*: 190 to 260 days

*Major Land Resource Area*: 40; Sonoran Basin and Range

*Land Resource Unit*: 40-1; Upper Sonoran Desert Shrub

### Map Unit Composition

Glendale, Sonoran, and similar soils: 55 percent

Hantz, Sonoran, and similar soils: 40 percent

Minor components: Gila, Vinton, Anthony, Contention

### Soil Properties and Qualities

#### Glendale, Sonoran soils

*Taxonomic classification*: Fine-silty, mixed, superactive, calcareous, thermic Typic Torrfluvents

*Geomorphic position*: dissected by erosional channels

*Parent material*: mixed stream alluvium

*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: 90 percent  
   Woody debris: 5 percent  
   Bare soil: 5 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:* 11.2 (very high)  
*Shrink-swell potential:* about 1.5 LEP (low)  
*Flooding hazard:* occasional  
*Runoff class:* low  
*Hydrologic group:* B  
*Ecological site name:* Prosopis velutina/Sporobolus wrightii  
*Ecological site number:* F040XA124AZ  
*Present vegetation:* mesquite, bush muhly, catclaw acacia, graythorn, plains  
   bristleglass, spike dropseed, annual grasses  
*Land capability (irrigated):* 3w  
*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Soza Canyon; about 2,500 feet south and 1,150 feet west of the northeast corner of section 32, Township 12 south, Range 19 east

*Geographic Coordinate System:* 32° 20' 50.00" north, 110° 25' 15.00" west

C1—0 to 4 inches (0 to 10 cm); dark brown (7.5YR 3/3) loam, very dark brown (7.5YR 2.5/3), moist; 21 percent clay; weak thin platy parting to moderate fine granular structure; soft, very friable, moderately sticky and moderately plastic; many very fine and fine roots; many very fine and fine irregular pores; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C2—4 to 19 inches (10 to 48 cm); dark brown (7.5YR 3/3) silty clay loam, very dark brown (7.5YR 2.5/3), moist; 35 percent clay; moderate fine granular structure; slightly hard, friable, very sticky and very plastic; many fine and common medium roots; many very fine and fine irregular pores; violently effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

C3—19 to 25 inches (48 to 64 cm); brown (10YR 4/3) silt loam, dark brown (10YR 3/3), moist; 20 percent clay; massive; soft, very friable, moderately sticky and very plastic; common fine and few coarse roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C4—25 to 40 inches (64 to 102 cm); dark brown (7.5YR 3/3) silt loam, very dark brown (7.5YR 2.5/3), moist; 20 percent clay; weak fine and medium subangular blocky structure; soft, very friable, moderately sticky and very plastic; few fine and common medium and coarse roots; many very fine tubular pores; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C5—40 to 60 inches (102 to 152 cm); brown (10YR 4/3) silt loam, dark brown (10YR 3/3), moist; 20 percent clay; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and very plastic; common fine roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.2.

### Range in Characteristics

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)  
Average clay content in the control section: 18 to 35 percent

#### C horizons

Hue: 7.5YR, 10YR  
Value: 3 to 6 dry, 2.5 to 5 moist  
Chroma: 2 to 4, dry or moist  
Texture: silt loam, silty clay loam, loam

#### Hantz, Sonoran soils

*Taxonomic classification:* Fine, mixed, superactive, calcareous, thermic Vertic  
Torrifluvents

*Geomorphic position:* dissected by erosional channels

*Parent material:* mixed stream alluvium

*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: 90 percent  
Woody debris: 5 percent  
Bare soil: 5 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:* 8.6 (high)

*Shrink-swell potential:* about 7.5 LEP (high)

*Flooding hazard:* occasional

*Runoff class:* low

*Hydrologic group:* C

*Ecological site name:* Prosopis velutina/Sporobolus wrightii

*Ecological site number:* F040XA124AZ

*Present vegetation:* Mojave seablite, mesquite, alkali sacaton, annual grasses, false  
Rhodesgrass, fourwing saltbush, wolfberry

*Land capability (irrigated):* 3w

*Land capability (nonirrigated):* 7c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Soza Canyon; about 1,900 feet and 1,600 feet west of the northeast corner of section 32, Township 12 south, Range 19 east  
*Geographic Coordinate System:* 32° 21' 0.00" north, 110° 25' 20.00" west

Ap—0 to 4 inches (0 to 10 cm); brown (7.5YR 4/4) clay loam, dark brown (7.5YR 3/4), moist; 35 percent clay; moderate very fine and fine cloddy structure; soft, very friable, very sticky and very plastic; many very fine and fine roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C1—4 to 10 inches (10 to 25 cm); brown (7.5YR 4/4) clay, dark brown (7.5YR 3/4),

moist; 45 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, very sticky and very plastic; many very fine and fine roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C2—10 to 23 inches (25 to 58 cm); brown (7.5YR 4/3) clay, dark brown (7.5YR 3/3), moist; 45 percent clay; moderate very fine and fine subangular blocky structure; hard, friable, very sticky and very plastic; many very fine and fine and few medium roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C3—23 to 46 inches (58 to 117 cm); brown (10YR 4/3) silty clay, dark brown (10YR 3/3), moist; 45 percent clay; moderate fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; many very fine and fine and few medium roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

2C—46 to 60 inches (117 to 152 cm); brown (7.5YR 4/3) sandy loam, dark brown (7.5YR 3/3), moist; 15 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine and few medium roots; common fine tubular pores; violently effervescent; moderately alkaline, pH 8.2.

#### Range in Characteristics

Soil cracking: many vertical cracks 0.25 inch to 3 inches wide from the surface to a depth of 27 inches

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 35 to 60 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

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

#### C horizons

Hue: 7.5YR, 10YR

Value: 3 to 6 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

Texture: silty clay loam, silty clay, clay

Some pedons contain strata of coarser material below 40 inches.

## 45—Graham-Lampshire-Rock outcrop complex, 5 to 60 percent slopes

### Map Unit Setting

*Landform(s):* mountains

*Elevation:* 3,900 to 4,600 feet (1,189 to 1,402 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Graham and similar soils: 40 percent  
 Lampshire and similar soils: 30 percent  
 Rock outcrop: 20 percent  
 Minor components: Bodecker, Riverwash

### Soil Properties and Qualities

#### Graham soils

*Taxonomic classification:* Clayey, smectitic, thermic Lithic Ustic Haplargids

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* slope alluvium derived from welded tuff

*Slope:* 5 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: 50 percent

  Woody debris: 0 percent

  Bare soil: 35 percent

  Rock fragments:

    • gravel: 55 percent

    • cobble: 10 percent

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

*Drainage class:* well drained

*Ksat solum:* 0.00 to 0.57 inches per hour (0.01 to 4.00 micrometers per second)

*Ksat restrictive layer:* 0.00 to 0.01 inches per hour (0.00 to 0.07 micrometers per second)

*Available water capacity total inches:* 1.9 (very low)

*Shrink-swell potential:* about 10.0 LEP (very high)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Volcanic Hills 12-16" p.z. Clayey

*Ecological site number:* R041XC330AZ

*Present vegetation:* sideoats grama, cane beardgrass, perennial forbs, green sprangletop, mimosa, mintbush lippia, snakeweed, tanglehead, mesquite

*Land capability (nonirrigated):* 6c

### Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—Cherry Spring Peak; about 2,100 feet west and 2,000 feet south of the northeast corner of section 16, Township 12 south, Range 20 east

*Geographic Coordinate System:* 32° 23' 31.40" north, 110° 18' 33.30" west

A—0 to 1 inch (0 to 3 cm); brown (7.5YR 4/2) gravelly sandy clay loam, very dark brown (7.5YR 2.5/2), moist; 28 percent clay; moderate very fine subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; many very

fine and fine roots; many very fine tubular pores; 20 percent gravel and 5 percent cobble; noneffervescent; slightly acid, pH 6.4; abrupt smooth boundary.

Bt1—1 to 9 inches (3 to 23 cm); dark brown (7.5YR 3/2) clay, very dark brown (7.5YR 2.5/2), moist; 55 percent clay; strong fine and medium angular blocky structure; very hard, very firm, very sticky and very plastic; common very fine and few medium roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; 5 percent gravel; noneffervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

Bt2—9 to 14 inches (23 to 36 cm); dark brown (7.5YR 3/2) clay, dark brown (7.5YR 3/2), moist; 50 percent clay; strong fine and medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common very fine roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.4; abrupt wavy boundary.

R—14 to 60 inches (36 to 152 cm); unweathered welded tuff bedrock.

### Range in Characteristics

Cracks: many vertical cracks 0.25 inch to 0.5 inch wide from surface to 10 inches

Rock fragments: 5 to 35 percent

Average percentage of clay in the control section: 40 to 60 percent

#### A horizon

Hue: 7.5YR

Value: 2 to 4 dry or moist

Chroma: 2 or 3 dry or moist

Texture: loam, sandy clay loam

Reaction: 6.1 to 6.5 (slightly acid)

#### Bt horizons

Hue: 5YR, 7.5YR

Value: 2.5 to 4 dry or moist

Chroma: 1 to 3, dry or moist

Texture: clay, clay loam

Reaction: 6.6 to 7.8 (neutral to slightly alkaline)

### Lampshire soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, nonacid, thermic Lithic Ustic Torriorthents

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* slope alluvium derived from andesite and rhyolite

*Slope:* 5 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: 10 percent

Woody debris: 0 percent

Bare soil: 15 percent

Rock fragments:

- gravel: 65 percent
- cobble: 10 percent

*Depth to restrictive feature(s):* 5 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 0.01 inches per hour (0.00 to 0.07 micrometers per second)

*Available water capacity total inches:* 0.6 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Volcanic Hills 12-16" p.z. Loamy

*Ecological site number:* R041XC323AZ

*Present vegetation:* sideoats grama, hairy grama, annual grasses, black grama, false mesquite, snakeweed, cane beardgrass, oneseed juniper, perennial forbs, plains lovegrass, tanglehead

*Land capability (nonirrigated):* 6c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Cherry Spring Peak; about 2,100 feet west and 2,300 feet south of the northeast corner of section 16, Township 12 south, Range 20 east

*Geographic Coordinate System:* 32° 23' 28.20" north, 110° 18' 32.60" west

A1—0 to 1 inch (0 to 3 cm); brown (7.5YR 4/2) very gravelly sandy loam, dark brown (7.5YR 3/2), moist; 13 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine irregular pores; 55 percent gravel; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

A2—1 to 10 inches (3 to 25 cm); brown (7.5YR 4/2) very gravelly sandy loam, dark brown (7.5YR 3/2), moist; 17 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine irregular pores; 50 percent gravel; noneffervescent; neutral, pH 6.8; abrupt wavy boundary.

R—10 to 60 inches (25 to 152 cm); unweathered andesite/ rhyolite bedrock.

### Range in Characteristics

Rock fragments: 35 to 60 percent

Reaction: 6.6 to 7.3 (neutral)

Average percentage of clay in the control section: 10 to 20 percent

#### A horizons

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 2 to 4 moist

Chroma: 2 or 3, dry or moist

Texture: loam, sandy loam

#### Rock outcrop

Rock outcrop consists of barren rock that occurs as ledges, massive boulder piles, and nearly vertical cliffs of andesite, rhyolite, and welded tuff. Rock outcrop also

includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the summit of mountains.

## **46—Grizzle-Rock outcrop complex, 10 to 50 percent slopes**

### **Map Unit Setting**

*Landform(s):* hills

*Elevation:* 3,800 to 4,800 feet (1,158 to 1,463 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### **Map Unit Composition**

Grizzle and similar soils: 60 percent

Rock outcrop: 30 percent

Minor components: Blakeney family, Riverwash

### **Soil Properties and Qualities**

#### **Grizzle soils**

*Taxonomic classification:* Loamy, mixed, superactive, thermic, shallow Ustic Calciargids

*Geomorphic position:* side slopes

*Parent material:* alluvium and/or colluvium derived from calcareous 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: 40 percent

    Woody debris: 5 percent

    Bare soil: 5 percent

    Rock fragments:

        • gravel: 35 percent

        • cobble: 15 percent

*Depth to restrictive feature(s):* 8 to 20 inches to densic material; 12 to 30 inches to bedrock, paralithic; 20 to 40 inches to bedrock, lithic

*Drainage class:* well drained

*Ksat solum:* 0.06 to 1.98 inches per hour (0.42 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:* 1.4 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* C

*Ecological site name:* Limestone Hills 12-16" p.z.

*Ecological site number:* R041XC307AZ

*Present vegetation:* jojoba, sideoats grama, catclaw acacia, ocotillo, whitethorn acacia, false mesquite, desert zinnia, slim tridens, pricklypear, cholla, purple threeawn, Palmer agave, sotol

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Soza Canyon; about 1,200 feet north and 1,000 feet west of the southeast corner of section 30, Township 13 south, Range 19 east

*Geographic Coordinate System:* 32° 16' 17.00" north, 110° 26' 17.00" west

A—0 to 1 inch (0 to 3 cm); reddish brown (5YR 5/4) loam, yellowish red (5YR 4/6), moist; 20 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many fine irregular pores; 5 percent gravel; violently effervescent, 14 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Btk—1 inch to 9 inches (3 to 23 cm); reddish brown (5YR 5/4) loam, red (2.5YR 4/6), moist; 20 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine irregular pores; few patchy distinct clay films on faces of peds; few continuous distinct carbonate coats on vertical faces of peds; 5 percent gravel; violently effervescent, 18 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Cdk—9 to 13 inches (23 to 33 cm); reddish brown (2.5YR 4/4) loam, dark reddish brown (2.5YR 3/4), moist; 20 percent clay; weak very fine and fine subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine and fine roots; many fine irregular pores; common continuous distinct carbonate coats on rock fragments; 5 percent gravel; violently effervescent, 17 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Crk—13 to 21 inches (33 to 53 cm); few very fine roots; common continuous distinct carbonate coats on fractures; weathered calcareous sandstone bedrock.

R—21 to 60 inches (53 to 152 cm); unweathered calcareous sandstone bedrock.

### Range in Characteristics

Rock fragments: 0 to 35 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 18 to 35 percent

Calcium carbonate equivalent: 5 to 20 percent

#### A horizon

Hue: 7.5YR, 5YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 to 6, dry or moist

Texture: loam, clay loam

#### B horizon

Hue: 2.5YR, 5YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 to 6, dry or moist

Texture: loam, clay loam

Cdk horizons

Hue: 2.5YR, 5YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 to 6, dry or moist

Texture: When crushed, includes loam, clay loam

Grizzle as used in this survey is a taxadjunct to the series because the paralithic contact is less than 20 inches deep. Grizzle series is a fine-loamy, mixed superactive, thermic Ustic Calciargids.

**Rock outcrop**

Rock outcrop consists of barren rock that occurs as ledges and nearly vertical cliffs of calcareous sandstone. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the summit of hills.

**47—Guest silty clay, 0 to 5 percent slopes**

**Map Unit Setting**

*Landform(s):* flood plains

*Elevation:* 3,900 to 4,600 feet (1,189 to 1,402 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

**Map Unit Composition**

Guest and similar soils: 70 percent

Minor components: Riverwash

**Soil Properties and Qualities**

**Guest soils**

*Taxonomic classification:* Fine, mixed, superactive, calcareous, thermic Ustertic  
Torrifluvents

*Geomorphic position:* dissected by erosional channels

*Parent material:* mixed calcareous alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 60 percent

Woody debris: 5 percent

Bare soil: 35 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*: 9.6 (high)  
*Shrink-swell potential*: about 7.5 LEP (high)  
*Flooding hazard*: occasional  
*Runoff class*: low  
*Hydrologic group*: C  
*Ecological site name*: Loamy Bottom 12-16" p.z.  
*Ecological site number*: R041XC312AZ  
*Present vegetation*: giant sacaton, mesquite, burroweed  
*Land capability (nonirrigated)*: 6c

### Typical Profile

#### Location

*Public Land Survey*: USGS Quadrangle—Deepwell Ranch; about 1,550 feet west and 2,200 feet south of the northeast corner of section 36, Township 14 south, Range 21 east

*Geographic Coordinate System*: 32° 10' 29.00" north, 110° 9' 12.00" west

C1—0 to 6 inches (0 to 15 cm); brown (7.5YR 4/2) silty clay, very dark brown (7.5YR 2.5/2), moist; 44 percent clay; weak thin platy parting to moderate very fine subangular blocky structure; slightly hard, friable, very sticky and very plastic; many medium roots; common very fine and fine tubular pores; strongly effervescent; slightly alkaline, pH 7.4; clear smooth boundary.

C2—6 to 40 inches (15 to 102 cm); brown (7.5YR 4/2) silty clay, very dark brown (7.5YR 2.5/2), moist; 44 percent clay; strong fine and medium angular blocky structure; slightly hard, friable, very sticky and very plastic; many medium roots; common very fine and fine tubular pores; strongly effervescent; slightly alkaline, pH 7.4; abrupt wavy boundary.

C3—40 to 60 inches (102 to 152 cm); brown (7.5YR 4/2) silty clay, very dark brown (7.5YR 2.5/2), moist; 46 percent clay; strong fine, medium, and coarse angular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; common very fine and fine tubular pores; strongly effervescent; slightly alkaline, pH 7.8.

### Range in Characteristics

Soil cracking: many vertical cracks 0.25 inch to 2 inches wide and from the surface to a depth of 25 inches

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in control section: 35 to 50 percent

#### C horizons

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 2 or 3, dry or moist

Texture: clay loam, silty clay loam, silty clay

## 48—Hantz complex, Chihuahuan, 0 to 2 percent slopes

### Map Unit Setting

*Landform(s)*: flood plains

*Elevation:* 3,000 to 3,590 feet (914 to 1,094 meters)  
*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)  
*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)  
*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)  
*Frost-free period:* 190 to 260 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### Map Unit Composition

Hantz, Chihuahuan, and similar soils: 45 percent  
 Hantz, Chihuahuan, saline-sodic, and similar soils: 35 percent  
 Minor components: Glendale, Gila, Vinton, Anthony, Hantz soils with coarser material below 30 inches

### Soil Properties and Qualities

#### Hantz, Chihuahuan soils

*Taxonomic classification:* Fine, mixed, superactive, calcareous, thermic Vertic Torrifuvents

*Geomorphic position:* dissected by erosional channels

*Parent material:* mixed stream alluvium

*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: 90 percent

Woody debris: 5 percent

Bare soil: 5 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:* 9.1 (high)

*Shrink-swell potential:* about 7.5 LEP (high)

*Flooding hazard:* occasional

*Runoff class:* low

*Hydrologic group:* C

*Ecological site name:* Prosopis glandulosa var. torreyana-Prosopis velutina/  
Sporobolus wrightii

*Ecological site number:* F041XB221AZ

*Present vegetation:* mesquite, burroweed, graythorn, seepweed, fourwing saltbush, alkali sacaton

*Land capability (irrigated):* 3w

*Land capability (nonirrigated):* 7c

### Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 650 feet north and 2,400 feet west of southeast corner of section 29, Township 15 south, Range 20 east  
*Geographic Coordinate System:* 32° 5' 36.00" north, 110° 19' 18.00" west

Ap—0 to 8 inches (0 to 20 cm); grayish brown (10YR 5/2) clay, dark brown (10YR 3/3), moist; 50 percent clay; strong medium and coarse cloddy structure; very hard, very firm, very sticky and very plastic; many very fine and fine and common coarse roots; many very fine and fine tubular pores; few distinct pressure faces; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Cky1—8 to 22 inches (20 to 56 cm); grayish brown (10YR 5/2) clay, dark brown (10YR 3/3), moist; 55 percent clay; strong fine, medium, and coarse angular blocky parting to moderate medium and coarse wedge structure; very hard, very firm, very sticky and very plastic; many very fine and common medium roots; many very fine and fine tubular pores; few distinct pressure faces; common fine carbonate and gypsum masses; violently effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Cky2—22 to 35 inches (56 to 89 cm); grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2), moist; 45 percent clay; strong fine, medium, and coarse angular blocky structure; very hard, very firm, very sticky and very plastic; many very fine roots; many very fine tubular pores; common fine carbonate and gypsum filaments; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Cky3—35 to 60 inches (89 to 152 cm); grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2), moist; 50 percent clay; strong fine, medium, and coarse angular blocky structure; very hard, very firm, very sticky and very plastic; many very fine roots; common very fine tubular pores; few distinct pressure faces; few fine carbonate and gypsum filaments; violently effervescent; moderately alkaline, pH 8.0.

### Range in Characteristics

Soil cracking: many vertical cracks 0.25 inch to 3 inches wide and from the surface to a depth of 27 inches

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 35 to 60 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 1 to 4, dry or moist

Texture: silty clay loam, silty clay, clay

#### C horizons

Hue: 7.5YR, 10YR

Value: 3 to 6 dry, 2 to 5 moist

Chroma: 1 to 4, dry or moist

Texture: silty clay loam, silty clay, clay

### Hantz, Chihuahuan, saline-sodic soils

*Taxonomic classification:* Fine, mixed, superactive, calcareous, thermic Vertic Torrifluvents

*Geomorphic position:* dissected by erosional channels

*Parent material:* mixed stream alluvium

*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: 90 percent  
   Woody debris: 5 percent  
   Bare soil: 5 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:* 6.0 (moderate)  
*Shrink-swell potential:* about 10.0 LEP (very high)  
*Flooding hazard:* occasional  
*Runoff class:* low  
*Hydrologic group:* C  
*Ecological site name:* Prosopis glandulosa var. torreyana-prosopis velutina/Suaeda  
   moquini-atrilex canescens/Sporobolus airoides  
*Ecological site number:* F041XB222AZ  
*Present vegetation:* Mojave seablite, mesquite, alkali sacaton, annual grasses, false  
   Rhodesgrass, fourwing saltbush, wolfberry  
*Land capability (irrigated):* 3w  
*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 500 feet east and  
 1,000 feet north of southeast corner of section 32, Township 15 south, Range 20 east  
*Geographic Coordinate System:* 32° 5' 0.00" north, 110° 19' 35.00" west

C—0 to 1 inch (0 to 3 cm); grayish brown (10YR 5/2) silty clay loam, very dark grayish  
 brown (10YR 3/2), moist; 35 percent clay; moderate medium platy parting to weak  
 very fine platy structure; soft, very friable, moderately sticky and moderately plastic;  
 many very fine vesicular pores; violently effervescent; strongly alkaline, pH 9.0;  
 abrupt smooth boundary.

Cknyz1—1 to 12 inches (3 to 30 cm); dark grayish brown (10YR 4/2) clay, very dark  
 grayish brown (10YR 3/2), moist; 50 percent clay; moderate fine and medium  
 subangular blocky structure; hard, very firm, very sticky and very plastic; many very  
 fine roots; common very fine tubular pores; common fine carbonate masses; many  
 fine salt and gypsum crystals; violently effervescent; strongly alkaline, pH 9.0; clear  
 wavy boundary.

Cknyz2—12 to 20 inches (30 to 51 cm); dark grayish brown (10YR 4/2) clay, very  
 dark gray (10YR 3/1), moist; 55 percent clay; moderate fine and medium subangular  
 blocky structure; hard, firm, very sticky and very plastic; few very fine roots; many  
 very fine and fine tubular pores; common fine carbonate masses; many fine salt and  
 gypsum crystals; violently effervescent; strongly alkaline, pH 9.0; abrupt smooth  
 boundary.

Cn1—20 to 36 inches (51 to 91 cm); brown (10YR 5/3) clay loam, very dark grayish  
 brown (10YR 3/2), moist; 35 percent clay; moderate fine and medium angular blocky  
 structure; very hard, very firm, very sticky and very plastic; few very fine roots; many  
 very fine and fine tubular pores; violently effervescent; very strongly alkaline, pH 9.2;  
 abrupt smooth boundary.

Cn2—36 to 60 inches (91 to 152 cm); brown (10YR 5/3) clay, dark brown (10YR 3/3),  
 moist; 50 percent clay; moderate fine and medium angular blocky structure; very

hard, very firm, very sticky and very plastic; few very fine roots; many very fine and fine tubular pores; violently effervescent; very strongly alkaline, pH 9.2.

### Range in Characteristics

Soil cracks: many vertical cracks 0.25 inch to 3.0 inches wide and from the surface to a depth of 25 inches

Soil is susceptible to piping and gullyng because of the high concentrations of salts.

Reaction: 7.9 to 9.6 (strongly to very strongly alkaline)

Average clay content in the control section: 35 to 60 percent

C horizons

Hue: 7.5YR, 10YR

Value: 3 to 6 dry, 2 to 5 moist

Chroma: 1 to 4, dry or moist

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

EC (mmhos/cm): 8 to 10 (moderately saline)

SAR: 30 to 50 (strongly sodic)

## 49—Hantz complex, Sonoran, 0 to 2 percent slopes

### Map Unit Setting

*Landform(s)*: flood plains

*Elevation*: 3,000 to 3,590 feet (914 to 1,094 meters)

*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature*: 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period*: 190 to 260 days

*Major Land Resource Area*: 40; Sonoran Basin and Range

*Land Resource Unit*: 40-1; Upper Sonoran Desert Shrub

### Map Unit Composition

Hantz, Sonoran and similar soils: 45 percent

Hantz, Sonoran, saline-sodic and similar soils: 35 percent

Minor components: Glendale, Gila, Vinton, Anthony, Hantz soils with coarser material below 30 inches

### Soil Properties and Qualities

#### Hantz, Sonoran soils

*Taxonomic classification*: Fine, mixed, superactive, calcareous, thermic Vertic Torrfluvents

*Geomorphic position*: dissected by erosional channels

*Parent material*: mixed stream alluvium

*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: 90 percent
- Woody debris: 5 percent
- Bare soil: 5 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:* 9.1 (high)

*Shrink-swell potential:* about 7.5 LEP (high)

*Flooding hazard:* occasional

*Runoff class:* low

*Hydrologic group:* C

*Ecological site name:* Prosopis velutina/Sporobolus wrightii

*Ecological site number:* F040XA124AZ

*Present vegetation:* mesquite, burroweed, graythorn, fourwing saltbush, alkali sacaton

*Land capability (irrigated):* 3w

*Land capability (nonirrigated):* 7c

### **Typical Profile**

**Location**

*Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 650 feet north and 2,400 feet west of southeast corner of section 29, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 5' 36.00" north, 110° 19' 18.00" west

Ap—0 to 8 inches (0 to 20 cm); grayish brown (10YR 5/2) clay, dark brown (10YR 3/3), moist; 50 percent clay; strong medium and coarse cloddy structure; very hard, very firm, very sticky and very plastic; many very fine and fine and common coarse roots; many very fine and fine tubular pores; few distinct pressure faces; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Cky1—8 to 22 inches (20 to 56 cm); grayish brown (10YR 5/2) clay, dark brown (10YR 3/3), moist; 55 percent clay; strong fine, medium, and coarse angular blocky parting to moderate medium and coarse wedge structure; very hard, very firm, very sticky and very plastic; many very fine and common medium roots; many very fine and fine tubular pores; few distinct pressure faces; common fine carbonate and gypsum masses; violently effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Cky2—22 to 35 inches (56 to 89 cm); grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2), moist; 45 percent clay; strong fine, medium, and coarse angular blocky structure; very hard, very firm, very sticky and very plastic; many very fine roots; many very fine tubular pores; common fine carbonate and gypsum filaments; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Cky3—35 to 60 inches (89 to 152 cm); grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2), moist; 50 percent clay; strong fine, medium, and coarse angular blocky structure; very hard, very firm, very sticky and very plastic; many very fine roots; common very fine tubular pores; few distinct pressure faces; few fine carbonate and gypsum filaments; violently effervescent; moderately alkaline, pH 8.0.

### **Range in Characteristics**

Soil cracking: many vertical cracks 0.25 inch to 3 inches wide and from the surface to a depth of 27 inches

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 35 to 60 percent

A horizon

Hue: 7.5YR, 10YR  
 Value: 3 to 5 dry, 2 to 4 moist  
 Chroma: 1 to 4, dry or moist  
 Texture: silty clay loam, silty clay, clay

C horizons

Hue: 7.5YR, 10YR  
 Value: 3 to 6 dry, 2 to 5 moist  
 Chroma: 1 to 4, dry or moist  
 Texture: silty clay loam, silty clay, clay

**Hantz, Sonoran, saline-sodic soils**

*Taxonomic classification:* Fine, mixed, superactive, calcareous, thermic Vertic  
 Torrifluvents

*Geomorphic position:* dissected by erosional channels

*Parent material:* mixed stream alluvium

*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: 90 percent  
 Woody debris: 5 percent  
 Bare soil: 5 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:* 6.0 (moderate)

*Shrink-swell potential:* about 7.5 LEP (high)

*Flooding hazard:* occasional

*Runoff class:* low

*Hydrologic group:* C

*Ecological site name:* Prosopis velutina/Sporobolus wrightii

*Ecological site number:* F040XA124AZ

*Present vegetation:* mesquite, burroweed, graythorn, seepweed, fourwing saltbush,  
 alkali sacaton

*Land capability (irrigated):* 3w

*Land capability (nonirrigated):* 7c

### Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 500 feet east and 1,000 feet north of southeast corner of section 32, Township 15 south, Range 20 east  
*Geographic Coordinate System:* 32° 5' 0.00" north, 110° 19' 35.00" west

C—0 to 1 inch (0 to 3 cm); grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2), moist; 35 percent clay; moderate medium platy parting to weak very fine platy structure; soft, very friable, moderately sticky and moderately plastic;

many very fine vesicular pores; violently effervescent; strongly alkaline, pH 9.0; abrupt smooth boundary.

Cknyz1—1 to 12 inches (3 to 30 cm); dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2), moist; 50 percent clay; moderate fine and medium subangular blocky structure; hard, very firm, very sticky and very plastic; many very fine roots; common very fine tubular pores; common fine carbonate masses; many fine salt and gypsum crystals; violently effervescent; strongly alkaline, pH 9.0; clear wavy boundary.

Cknyz2—12 to 20 inches (30 to 51 cm); dark grayish brown (10YR 4/2) clay, very dark gray (10YR 3/1), moist; 55 percent clay; moderate fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; many very fine and fine tubular pores; common fine carbonate masses; many fine salt and gypsum crystals; violently effervescent; strongly alkaline, pH 9.0; abrupt smooth boundary.

Cn1—20 to 36 inches (51 to 91 cm); brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2), moist; 35 percent clay; moderate fine and medium angular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; many very fine and fine tubular pores; violently effervescent; very strongly alkaline, pH 9.2; abrupt smooth boundary.

Cn2—36 to 60 inches (91 to 152 cm); brown (10YR 5/3) clay, dark brown (10YR 3/3), moist; 50 percent clay; moderate fine and medium angular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; many very fine and fine tubular pores; violently effervescent; very strongly alkaline, pH 9.2.

### Range in Characteristics

Soil cracks: many vertical cracks 0.25 inch to 3.0 inches wide and from the surface to a depth of 25 inches

Soil is susceptible to piping and gulying because of the high concentrations of salts

Reaction: 7.9 to 9.6 (strongly to very strongly alkaline)

Average clay content in the control section: 35 to 60 percent

#### C horizons

Hue: 7.5YR, 10YR

Value: 3 to 6 dry, 2 to 5 moist

Chroma: 1 to 4, dry or moist

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

EC (mmhos/cm): 8 to 10 (moderately saline)

SAR: 30 to 50 (strongly sodic)

## 50—Hantz silt loam, saline-sodic, 0 to 3 percent slopes

### Map Unit Setting

*Landform(s):* flood plains

*Elevation:* 2,900 to 3,800 feet (884 to 1,158 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-2; Chihuahuan-Sonoran Desert Shrub Mix

## Map Unit Composition

Hantz and similar soils: 85 percent  
 Minor components: Glendale, Gila, Contention

## Soil Properties and Qualities

### Hantz soils

*Taxonomic classification:* Fine, mixed, superactive, calcareous, thermic Vertic  
 Torrifluvents

*Geomorphic position:* dissected by erosional channels

*Parent material:* mixed stream alluvium

*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: 80 percent

Woody debris: 0 percent

Bare soil: 20 percent

Rock fragments: 0 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:* 7.6 (high)

*Shrink-swell potential:* about 7.5 LEP (high)

*Flooding hazard:* occasional

*Runoff class:* low

*Hydrologic group:* C

*Ecological site name:* Saline Bottom 8-12" p.z.

*Ecological site number:* R041XB211AZ

*Present vegetation:* Mojave seablite, mesquite, alkali sacaton, annual grasses, false  
 Rhodesgrass, fourwing saltbush, wolfberry

*Land capability (irrigated):* 3s

*Land capability (nonirrigated):* 7c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle Land; about 600 feet west and 1,250 feet  
 south of the northeast corner of section 33, Township 18 south, Range 21 east

*Geographic Coordinate System:* 31° 49' 45.00" north, 110° 12' 40.00" west

C—0 to 3 inches (0 to 8 cm); light brown (7.5YR 6/3) silt loam, brown (7.5YR 4/3),  
 moist; 22 percent clay; weak thin and strong thick platy structure; soft, very friable,  
 moderately sticky and moderately plastic; few very fine roots; many fine and medium  
 vesicular pores; violently effervescent; strongly alkaline, pH 8.8; abrupt wavy  
 boundary.

Cny1—3 to 14 inches (8 to 36 cm); brown (7.5YR 5/2) silty clay loam, brown (7.5YR  
 4/2), moist; 35 percent clay; moderate medium subangular blocky structure; soft, very  
 friable, very sticky and very plastic; many very fine and fine roots; common fine

vesicular pores; many salt crystals on faces of peds; few fine gypsum crystals; violently effervescent; strongly alkaline, pH 8.8; abrupt wavy boundary.

Cny2—14 to 42 inches (36 to 107 cm); brown (7.5YR 5/3) silty clay, brown (7.5YR 4/3), moist; 45 percent clay; weak medium wedge structure; slightly hard, very friable, very sticky and very plastic; few very fine roots; common fine tubular and irregular pores; common salt crystals on faces of peds; few fine gypsum crystals; violently effervescent; very strongly alkaline, pH 9.6; abrupt smooth boundary.

Cn—42 to 60 inches (107 to 152 cm); brown (7.5YR 5/4) silty clay, brown (7.5YR 4/4), moist; 45 percent clay; massive; slightly hard, very friable, very sticky and very plastic; common fine roots; few fine tubular and irregular pores; many salt crystals on faces of peds; violently effervescent; very strongly alkaline, pH 9.6.

### Range in Characteristics

Soil cracking: many vertical cracks 0.25 to 0.50 inch wide from the surface to a depth of 20 inches

Reaction: 7.9 to 10.0 (moderately to very strongly alkaline)

Average clay content in the control section: 35 to 50 percent

Gypsum content: 0 to 2 percent

EC (mmhos/cm): 4 to 16 (slightly to moderately saline)

SAR: 13 to 60 (moderate to strongly sodic)

C horizons

Hue: 10YR, 7.5YR

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 2 to 4, dry or moist

Texture: silt loam, silty clay loam, silty clay

## 51—Kahn silt loam, 0 to 5 percent slopes

### Map Unit Setting

*Landform(s):* alluvial fans

*Elevation:* 3,900 to 4,600 feet (1,189 to 1,402 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Kahn and similar soils: 80 percent

Minor components: Stronghold, Pedregosa

### Soil Properties and Qualities

#### Kahn soils

*Taxonomic classification:* Fine-loamy, mixed, superactive, thermic Ustic Haplocalcids

*Geomorphic position:* inset between terraces

*Parent material:* mixed calcareous fan alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 80 percent

Woody debris: 15 percent

Bare soil: 10 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:* 10.1 (very high)*Shrink-swell potential:* about 4.5 LEP (moderate)*Flooding hazard:* occasional*Runoff class:* low*Hydrologic group:* B*Ecological site name:* Limy Fan 12-16" p.z.*Ecological site number:* R041XC320AZ*Present vegetation:* tarbush, bush muhly, burrograss, Rothrock's grama, annual forbs, perennial forbs, winterfat, banana yucca, fourwing saltbush, giant sacaton*Land capability (nonirrigated):* 6c**Typical Profile***Location**Public Land Survey:* USGS Quadrangle—Cochise; about 650 feet west and 2,600 feet south of the northeast corner of section 24, Township 16 south, Range 23 east*Geographic Coordinate System:* 32° 1' 43.80" north, 109° 56' 49.20" west

A—0 to 2 inches (0 to 5 cm); yellowish brown (10YR 5/4) silt loam, brown (10YR 4/3), moist; 25 percent clay; moderate medium and thick platy structure; soft, very friable, moderately sticky and very plastic; many very fine and fine roots; many very fine vesicular pores; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk1—2 to 22 inches (5 to 56 cm); brown (10YR 5/3) loam, brown (10YR 4/3), moist; 24 percent clay; weak very fine subangular blocky structure; soft, very friable, moderately sticky and very plastic; many very fine and fine roots; many very fine tubular pores; common continuous distinct carbonate coats on faces of peds; few very fine carbonate masses; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

Bk2—22 to 35 inches (56 to 89 cm); yellowish brown (10YR 5/4) clay loam, brown (10YR 4/3), moist; 35 percent clay; moderate very fine and fine subangular blocky structure; soft, very friable, moderately sticky and very plastic; many very fine and fine roots; many very fine tubular pores; many continuous distinct carbonate coats on faces of peds; many fine carbonate filaments and masses; violently effervescent, 28 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bk3—35 to 60 inches (89 to 152 cm); 40 percent brown (7.5YR 5/4) and 60 percent very pale brown (10YR 7/4) sandy clay loam, yellowish brown (10YR 5/4), moist; 30 percent clay; moderate very fine and fine subangular blocky structure; hard, friable, moderately sticky and moderately plastic; common very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on faces of peds; 10 percent petronodes; violently effervescent, 32 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

### Range in Characteristics

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in control section: 18 to 35 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: silt loam, loam

#### Bk1 horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 to 4, dry or moist

Texture: silt loam, loam

Calcium carbonate equivalent: 1 to 10 percent

#### Bk2 and Bk3 horizon

Hue: 7.5YR, 10YR

Value: 5 to 7 dry, 4 or 5 moist

Chroma: 3 to 5, dry or moist

Texture: loam, clay loam, sandy clay loam

Calcium carbonate equivalent: 5 to 40 percent

Rock fragments: 0 to 15 percent petronodes

Cementation: weakly to moderately cemented in some pedons

## 52—Keysto-Riverwash complex, 1 to 5 percent slopes

### Map Unit Setting

*Landform(s):* alluvial fans and flood plains

*Elevation:* 4,500 to 5,200 feet (1,372 to 1,585 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Keysto and similar soils: 60 percent

Riverwash: 30 percent

Minor components: Bodecker, Eloma, Caralampi, White House

## Soil Properties and Qualities

### Keysto soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, nonacid, thermic Ustic Torrfluvents

*Geomorphic position:* higher and adjacent to Riverwash

*Parent material:* mixed stream alluvium

*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: 50 percent

Woody debris: 10 percent

Bare soil: 10 percent

Rock fragments:

- gravel: 20 percent

- cobble: 10 percent

- stone: 15 percent

- boulder: 10 percent

*Drainage class:* well drained

*Ksat solum:* 1.98 to 39.69 inches per hour (14.00 to 280.00 micrometers per second)

*Available water capacity total inches:* 2.4 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* rare

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Sandy Wash 12-16" p.z.

*Ecological site number:* R041XC316AZ

*Present vegetation:* Arizona cottontop, green sprangletop, sideoats grama, spike dropseed, cane beardgrass, catclaw acacia, desert willow, giant sacaton, netleaf hackberry, mesquite

*Land capability (nonirrigated):* 6c

## Typical Profile

### Location

*Public Land Survey:* Typical pedon is from the soil survey of Cochise County, Arizona, Douglas-Tombstone Part; USGS Quadrangle McGrew Springs; about 1,400 feet east and 250 feet south from the northwest corner of section 36, Township 18 south, Range 19 east

*Geographic Coordinate System:* 31° 49' 55.00" north, 110° 22' 0.00" west

C1—0 to 9 inches (0 to 23 cm); brown (10YR 5/3) very cobbly sandy loam, very dark grayish brown (10YR 3/2), moist; 6 percent clay; weak thin platy structure; loose, nonsticky and nonplastic; many very fine and fine and common medium roots; few

fine irregular pores; 10 percent gravel, 30 percent cobble, and 5 percent stone; noneffervescent; slightly acid, pH 6.2; clear wavy boundary.

C2—9 to 30 inches (23 to 76 cm); brown (7.5YR 5/3) extremely bouldery sandy loam, dark brown (7.5YR 3/3), moist; 6 percent clay; massive; loose, nonsticky and nonplastic; many very fine and fine and common medium roots; few fine irregular pores; 10 percent gravel, 35 percent cobble, 15 percent stone, and 15 percent boulder; noneffervescent; slightly acid, pH 6.4; abrupt wavy boundary.

C3—30 to 60 inches (76 to 152 cm); brown (7.5YR 5/4) extremely bouldery coarse sand, dark brown (7.5YR 3/4), moist; 6 percent clay; massive; loose, nonsticky and nonplastic; common very fine and fine roots; few fine irregular pores; 10 percent gravel and 20 percent cobble and 20 percent stone and 20 percent boulder; noneffervescent; neutral, pH 6.6.

### Range in Characteristics

Rock fragments: 40 to 75 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average clay content in the control section: 3 to 10 percent

#### C horizons

Hue: 10YR, 7.5YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 2 to 4, dry or moist

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

#### Riverwash

Riverwash consists of very deep, excessively drained, stratified sands, gravels, and cobbles from numerous sources. The materials are in the drainageways of this unit, commonly bordered by shallow to steep vertical banks cut into the alluvium. These materials are not stable and are subject to shifting and sorting. Riverwash is usually dry but can be transformed into a temporary watercourse or a short-lived torrent after a heavy rain within the watershed. These materials do not support vegetation.

## 53—Kuykendall-Cherrycow-Rock outcrop complex, 5 to 60 percent slopes

### Map Unit Setting

*Landform(s):* mountains

*Elevation:* 4,400 to 5,600 feet (1,341 to 1,707 meters)

*Mean annual precipitation:* 16 to 20 inches (406 to 508 millimeters)

*Mean annual air temperature:* 57 to 62 degrees F (13.9 to 16.7 degrees C)

*Mean annual soil temperature:* 59 to 64 degrees F (15.0 to 17.8 degrees C)

*Frost-free period:* 160 to 210 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-1; Mexican Oak-Pinyon Woodland and Oak Savannah

### Map Unit Composition

Kuykendall and similar soils: 40 percent

Cherrycow and similar soils: 35 percent

Rock outcrop: 15 percent

Minor components: Magoffin, Riverwash, Terrarossa, Blacktail

## Soil Properties and Qualities

### Kuykendall soils

*Taxonomic classification:* Clayey, smectitic, thermic Aridic Lithic Argiustolls

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* slope alluvium derived from andesite

*Slope:* 5 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: 90 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

- gravel: 15 percent
- cobble: 35 percent
- stone: 15 percent

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

*Drainage class:* well drained

*Ksat solum:* 0.00 to 0.57 inches per hour (0.01 to 4.00 micrometers per second)

*Ksat restrictive layer:* 0.00 to 0.01 inches per hour (0.00 to 0.07 micrometers per second)

*Available water capacity total inches:* 2.1 (very low)

*Shrink-swell potential:* about 10.0 LEP (very high)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Volcanic Hills 16-20" p.z.

*Ecological site number:* R041XA111AZ

*Present vegetation:* annual grasses, sideoats grama, mesquite, cane beardgrass, green sprangletop, hairy grama, perennial forbs, purple grama, shrubby buckwheat

*Land capability (nonirrigated):* 6c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—Hookers Hot Springs; about 2,300 feet west and 2,200 feet south of the northeast corner of section 31, Township 13 south, Range 22 east

*Geographic Coordinate System:* 32° 20' 51.50" north, 110° 8' 33.20" west

A—0 to 1 inch (0 to 3 cm); dark brown (7.5YR 3/2) cobbly sandy clay loam, very dark brown (7.5YR 2.5/2), moist; 23 percent clay; weak thin platy parting to weak very fine granular structure; soft, very friable, very sticky and very plastic; many very fine roots; many very fine interstitial pores; 10 percent gravel and 10 percent cobble; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

Bt1—1 to 11 inches (3 to 28 cm); brown (7.5YR 4/2) cobbly clay, dark brown (7.5YR

3/2), moist; 48 percent clay; strong fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; common very fine roots; many very fine tubular pores; many distinct pressure faces; many continuous distinct clay films on rock fragments and on faces of peds; 5 percent gravel and 10 percent cobble; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

Bt<sub>2</sub>—11 to 16 inches (28 to 41 cm); brown (7.5YR 4/3) cobbly clay, dark brown (7.5YR 3/3), moist; 55 percent clay; strong fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; many very fine tubular pores; many distinct pressure faces; many continuous distinct clay films on rock fragments and on faces of peds; 5 percent gravel and 10 percent cobble; noneffervescent; slightly acid, pH 6.2; abrupt wavy boundary.

R—16 to 60 inches (41 to 152 cm); unweathered andesite bedrock.

### Range in Characteristics

Rock fragments: 10 to 35 percent

Organic matter: 1 to 3 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average percentage of clay in the control section: 40 to 60 percent

#### A horizon

Hue: 5YR, 7.5YR

Value: 3 or 4 dry, 2.5 or 3 moist

Chroma: 1 to 3, dry or moist

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

#### Bt horizons

Hue: 7.5YR, 5YR

Value: 3 or 4 dry, 2.5 or 3 moist

Chroma: 1 to 3, dry or moist

Texture: clay

### Cherrycow soils

*Taxonomic classification:* Fine, smectitic, thermic Aridic Argiustolls

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* slope alluvium derived from welded tuff

*Slope:* 5 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: 90 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

- gravel: 25 percent

- cobble: 15 percent

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

*Drainage class:* moderately well drained

*Ksat solum:* 0.00 to 0.57 inches per hour (0.01 to 4.00 micrometers per second)

*Ksat restrictive layer:* 0.00 to 0.01 inches per hour (0.00 to 0.07 micrometers per second)

*Available water capacity total inches:* 3.1 (low)

*Shrink-swell potential:* about 10.0 LEP (very high)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Volcanic Hills 16-20" p.z.

*Ecological site number:* R041XA111AZ

*Present vegetation:* annual grasses, sideoats grama, mesquite, Arizona white oak, bullgrass, cane beardgrass, curly mesquite, green sprangletop, oneseed juniper, hairy grama, perennial forbs, purple grama, shrubby buckwheat, feather fingergrass

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Hookers Hot Springs; about 1,800 feet north and 250 feet west of the southeast corner of section 25, Township 12 south, Range 21 east

*Geographic Coordinate System:* 32° 21' 30.20" north, 110° 8' 51.07" west

A—0 to 3 inches (0 to 8 cm); brown (7.5YR 4/2) sandy clay loam, black (7.5YR 2.5/1), moist; 30 percent clay; moderate very thin and thin platy parting to moderate fine and medium subangular blocky structure; soft, very friable, very sticky and very plastic; many very fine and fine roots; many very fine irregular pores; 10 percent gravel; noneffervescent; slightly acid, pH 6.2; clear wavy boundary.

Bt1—3 to 17 inches (8 to 43 cm); dark brown (7.5YR 3/2) clay, very dark brown (7.5YR 2.5/2), moist; 60 percent clay; strong fine and medium and coarse angular blocky structure; extremely hard, very firm, very sticky and very plastic; many very fine and common medium roots; many very fine tubular pores; many distinct pressure faces; many continuous distinct clay films on rock fragments and on faces of peds; 5 percent gravel; noneffervescent; moderately acid, pH 6.0; clear wavy boundary.

Bt2—17 to 22 inches (43 to 56 cm); dark reddish brown (5YR 3/3) clay, dark reddish brown (5YR 3/3), moist; 42 percent clay; moderate fine and medium angular blocky structure; slightly hard, friable, very sticky and very plastic; few very fine and common medium roots; many very fine tubular pores; many distinct pressure faces; many continuous distinct clay films on rock fragments and on faces of peds; 10 percent gravel; noneffervescent; slightly acid, pH 6.4; abrupt wavy boundary.

R—22 to 60 inches (56 to 152 cm); unweathered welded tuff bedrock.

### Range in Characteristics

Rock fragments: 5 to 25 percent

Organic matter: 1 to 3 percent

Reaction: 5.6 to 7.3 (moderately acid to neutral)

Average percentage of clay in the control section: 40 to 60 percent

#### A horizon

Hue: 5YR, 7.5YR

Value: 3 or 4 dry, 2.5 or 3 moist

Chroma: 1 or 2, dry or moist

Texture: sandy clay loam, clay

**Bt horizons**

Hue: 5YR, 7.5YR  
 Value: 3 or 4 dry, 2.5 or 3 moist  
 Chroma: 1 to 4 dry, 2 to 4 moist  
 Texture: clay

**Rock outcrop**

Rock outcrop consists of barren rock that occurs as ledges, massive boulder piles, and nearly vertical cliffs of welded tuff and andesite. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the summit of mountains.

**54—Lanque sandy loam, 0 to 5 percent slopes****Map Unit Setting**

*Landform(s):* alluvial fans  
*Elevation:* 4,400 to 5,600 feet (1,341 to 1,707 meters)  
*Mean annual precipitation:* 16 to 20 inches (406 to 508 millimeters)  
*Mean annual air temperature:* 57 to 62 degrees F (13.9 to 16.7 degrees C)  
*Mean annual soil temperature:* 59 to 64 degrees F (15.0 to 17.8 degrees C)  
*Frost-free period:* 160 to 210 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-1; Mexican Oak-Pine Woodland and Oak Savannah

**Map Unit Composition**

Lanque and similar soils: 90 percent  
 Minor components: soils with greater than 18 percent clay

**Soil Properties and Qualities****Lanque soils**

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Pachic Haplustolls

*Geomorphic position:* inset between terraces and hills

*Parent material:* fan alluvium from granite

*Slope:* 0 to 5 percent

**Surface cover:**

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 40 percent

Woody debris: 5 percent

Bare soil: 40 percent

Rock fragments:

• gravel: 15 percent

*Drainage class:* well drained

*Ksat solum:* 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

*Available water capacity total inches:* 6.6 (moderate)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* rare

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Loamy Swale 16-20" p.z.

*Ecological site numbers:* R041XA115AZ

*Present vegetation:* mesquite, sand dropseed, bush muhly, mimosa, soap tree yucca, spidergrass

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Dagoon; about 650 feet east and 2,700 feet north of the southwest corner of section 14, Township 16 south, Range 22 east  
*Geographic Coordinate System:* 32° 2' 36.00" north, 110° 4' 32.00" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/2) sandy loam, very dark brown (7.5YR 2.5/2), moist; 10 percent clay; weak thin platy structure parting to single grain; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular and common fine irregular pores; 5 percent gravel; noneffervescent; slightly acid, pH 6.4; abrupt smooth boundary.

C—2 to 40 inches (5 to 102 cm); dark grayish brown (10YR 4/2) sandy loam, (10YR 2.5/2), moist; 12 percent clay; massive; slightly hard, firm, nonsticky and slightly plastic; few very fine, common medium, and few coarse roots; many very fine tubular pores; 5 percent gravel; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

Ck—40 to 60 inches (102 to 152 cm); brown (10YR 5/3) sandy loam, dark brown (10YR 3/3), moist; 10 percent clay; massive; slightly hard, firm, nonsticky and slightly plastic; few medium roots; many very fine tubular pores; common fine carbonate masses; 5 percent gravel; strongly effervescent; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 0 to 15 percent

Organic matter: 1 to 3 percent

Reaction: 6.1 to 7.8 (slightly acid to slightly alkaline)

Average percentage of clay in control section: 5 to 15 percent

A and C horizons

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Texture: sandy loam, loamy sand

Some pedons have a buried argillic horizon.

## 55—Libby-Gulch complex, 0 to 10 percent slopes

### Map Unit Setting

*Landform(s):* fan terraces

*Elevation:* 3,800 to 4,600 feet (1,158 to 1,402 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Libby and similar soils: 45 percent

Gulch and similar soils: 35 percent

Minor components: Diaspar, Courtland, Sasabe, Combate, Bodecker, McNeal, Luckyhills, Baboquivari, Nolam

### Soil Properties and Qualities

#### Libby soils

*Taxonomic classification:* Fine, mixed, superactive, thermic Petronodic Ustic Paleargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*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: 5 percent

Bare soil: 60 percent

Rock fragments: 0 percent

*Depth to restrictive feature(s):* 3 to 15 inches to abrupt textural change

*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:* none

*Runoff class:* medium

*Hydrologic group:* C

*Ecological site name:* Loamy Upland 12-16" p.z.

*Ecological site number:* R041XC313AZ

*Present vegetation:* black grama, sideoats grama, tarbush, burroweed, cane beardgrass, desert broom baccharis, desert zinnia, false mesquite, mesquite, plains bristlegrass, tobosa, whitethorn acacia

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Benson; about 200 feet north and 2,000 feet west of southeast corner of section 36, Township 16 south, Range 19 east

*Geographic Coordinate System:* 31° 59' 34.30" north, 110° 21' 21.20" west

A—0 to 4 inches (0 to 10 cm); brown (7.5YR 4/3) sandy loam, dark brown (7.5YR 3/3), moist; 11 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, slightly sticky and nonplastic; many very fine and fine roots; few fine vesicular and many fine tubular pores; 10 percent gravel; noneffervescent; neutral, pH 7.2; abrupt smooth boundary.

Bt—4 to 25 inches (10 to 64 cm); reddish brown (2.5YR 4/4) sandy clay, red (2.5YR 4/6), moist; 47 percent clay; moderate fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; common very fine and fine roots; many fine interstitial and tubular pores; many continuous distinct organic stains on faces of peds; many continuous distinct clay films on rock fragments, on faces of peds, between sand grains; 10 percent gravel; noneffervescent; neutral, pH 7.2; abrupt smooth boundary.

Bt<sub>yc</sub>1—25 to 40 inches (64 to 102 cm); 50 percent reddish brown (5YR 5/4) and 50 percent light reddish brown (5YR 6/3) gravelly clay loam, reddish brown (5YR 5/4), moist; 33 percent clay; moderate very fine and fine subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few very fine and fine roots; many fine tubular pores; common continuous distinct clay films on faces of peds; common fine gypsum crystals; common fine gypsum masses; 25 percent petronodes; violently effervescent, 23 percent calcium carbonate equivalent and 1 percent gypsum; moderately alkaline, pH 8.0; clear smooth boundary.

Bt<sub>yc</sub>2—40 to 60 inches (102 to 152 cm); light reddish brown (5YR 6/4) gravelly sandy clay loam, reddish brown (5YR 5/4), moist; 29 percent clay; moderate very fine and fine subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few very fine and fine roots; many fine tubular pores; few continuous distinct clay films on faces of peds; common fine gypsum; 20 percent petronodes; violently effervescent, 21 percent calcium carbonate equivalent and 1 percent gypsum; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 10 to 35 percent gravel and petronodes, but can range to 55 percent in any one horizon

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 35 to 50 percent

Calcium carbonate equivalent: 5 to 25 percent

#### A horizon

Hue: 5YR, 7.5YR

Value: 3 to 5, dry or moist

Chroma: 3 to 6, dry or moist

Texture: fine sandy loam, sandy loam, loam

#### Bt horizon

Hue: 2.5YR, 5YR

Value: 3 to 5, dry or moist

Chroma: 4 or 6, dry or moist

Texture: clay, sandy clay

#### Bt<sub>yc</sub> horizons

Hue: 2.5YR, 5YR

Value: 3 to 6, dry or moist

Chroma: 3 to 6, dry or moist

Texture: clay, clay loam, sandy clay loam

Gypsum content: 0 to 2 percent

### Gulch soils

*Taxonomic classification:* Fine-loamy, mixed, superactive, thermic Ustic Calciargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed calcareous fan alluvium

*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: 5 percent
  - Bare soil: 60 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:* 6.9 (moderate)

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* none

*Runoff class:* medium

*Hydrologic group:* B

*Ecological site name:* Limy Upland 12-16" p.z.

*Ecological site number:* R041XC309AZ

*Present vegetation:* black grama, creosotebush, tarbush, whitethorn acacia, cane beardgrass, desert zinnia, mariola, plains bristlegrass, slim tridens

*Land capability (nonirrigated):* 6c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Benson; about 900 feet north and 300 feet west of the southeast corner of section 35, Township 16 south, Range 19 east

*Geographic Coordinate System:* 31° 59' 41.40" north, 110° 22' 2.30" west

A—0 to 4 inches (0 to 10 cm); yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6), moist; 14 percent clay; weak very thin platy parting to weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; noneffervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Btky1—4 to 19 inches (10 to 48 cm); yellowish red (5YR 5/6) sandy clay loam, reddish brown (5YR 5/4), moist; 27 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and moderately plastic; common very fine and fine roots; many very fine interstitial pores; common continuous distinct clay films on rock fragments and on faces of peds; many continuous distinct carbonate coats on rock fragments; common fine carbonate and gypsum masses; 10 percent gravel; violently effervescent, 7 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.0; abrupt smooth boundary.

Btky2—19 to 36 inches (48 to 91 cm); light reddish brown (5YR 6/4) gravelly sandy loam, reddish brown (5YR 5/4), moist; 19 percent clay; moderate fine and medium angular blocky structure; hard, firm, moderately sticky and moderately plastic; common very fine and fine roots; many very fine tubular pores; common continuous distinct clay films on faces of peds; many continuous distinct carbonate coats on rock fragments; common fine carbonate and gypsum masses; 15 percent gravel; violently effervescent, 27 percent calcium carbonate equivalent and 2 percent gypsum; strongly alkaline, pH 8.6; abrupt smooth boundary.

Bky—36 to 60 inches (91 to 152 cm); yellowish red (5YR 5/6) sandy loam, reddish brown (5YR 5/4), moist; 11 percent clay; massive; loose, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores; common fine carbonate and gypsum masses; 10 percent gravel; violently effervescent, 7 percent calcium carbonate equivalent and 2 percent gypsum; strongly alkaline, pH 8.6.

### Range in Characteristics

Rock fragments: 0 to 35 percent

Reaction: 7.4 to 9.0 (slightly to strongly alkaline)

Average clay content in the control section: 18 to 35 percent

#### A horizon

Hue: 7.5YR, 5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 4 to 6, dry or moist

Texture: fine sandy loam, sandy loam

#### Btky horizons

Hue: 7.5YR, 5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 4 or 6 dry, 3 or 4 moist

Texture: sandy clay loam, sandy loam

Calcium carbonate equivalent: 10 to 30 percent

Gypsum content: 1 to 4 percent

#### Bky horizon

Hue: 7.5YR, 5YR

Value: 4 or 5, dry or moist

Chroma: 4 to 6, dry or moist

Texture: sandy clay loam, sandy loam

Calcium carbonate equivalent: 15 to 40 percent

Gypsum content: 1 to 4 percent

## 56—Luckyhills-McNeal complex, 5 to 20 percent slopes

### Map Unit Setting

*Landform(s):* fan terraces

*Elevation:* 3,900 to 4,600 feet (1,189 to 1,402 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Luckyhills and similar soils: 55 percent

McNeal and similar soils: 30 percent

Minor components: Gulch, Libby, Nolah, McAllister, Courtland

### Soil Properties and Qualities

#### Luckyhills soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Ustic Haplocalcids

*Geomorphic position:* side slopes

*Parent material:* mixed calcareous fan alluvium

*Slope:* 5 to 20 percent

*Surface cover:*

Biological crust

  Cyanobacteria: 0 percent

  Lichen: 0 percent

  Moss: 0 percent

Chemical crust

  Salt: 0 percent

  Gypsum: 0 percent

Physical cover

  Canopy plant cover: 45 percent

  Woody debris: 5 percent

  Bare soil: 60 percent

  Rock fragments:

- gravel: 5 percent

*Drainage class:* well drained

*Ksat solum:* 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

*Available water capacity total inches:* 6.4 (moderate)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Limy Upland 12-16" p.z.

*Ecological site number:* R041XC309AZ

*Present vegetation:* creosotebush, tarbush, whitethorn acacia, desert zinnia, black grama, bush muhly, mariola, perennial forbs, banana yucca, burroweed, Mormon tea

*Land capability (nonirrigated):* 6c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—St. David; about 2,350 feet north and 100 feet west of southeast corner of section 36, Township 17 south, Range 21 east

*Geographic Coordinate System:* 31° 54' 38.70" north, 110° 8' 46.30" west

A—0 to 1 inch (0 to 3 cm); light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4), moist; 11 percent clay; weak medium platy and weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 5 percent gravel; slightly effervescent, 7 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Bk1—1 inch to 12 inches (3 to 30 cm); light brown (7.5YR 6/4) loam, brown (7.5YR 5/4), moist; 15 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and medium roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; many very fine carbonate masses; 10 percent gravel; violently effervescent, 26 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt wavy boundary.

Bk2—12 to 34 inches (30 to 86 cm); pink (7.5YR 7/3) gravelly loam, light brown (7.5YR 6/4), moist; 11 percent clay; moderate very fine, fine, and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; many very fine carbonate masses; 20 percent gravel; violently

effervescent, 24 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bk3—34 to 60 inches (86 to 152 cm); pink (7.5YR 7/3) loamy sand, light brown (7.5YR 6/4), moist; 5 percent clay; single grain; loose, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; few continuous distinct carbonate coats on rock fragments; 10 percent gravel; violently effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 5 to 20 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 10 to 18 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam

#### Bk horizons

Hue: 7.5YR, 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 or 4 dry, 3 to 6 moist

Texture: loam, sandy loam, loamy sand

Calcium carbonate equivalent: 5 to 30 percent

### McNeal soils

*Taxonomic classification:* Fine-loamy, mixed, superactive, thermic Ustic Calcicargids

*Geomorphic position:* shoulders

*Parent material:* mixed calcareous fan alluvium

*Slope:* 5 to 20 percent

#### *Surface cover:*

##### Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

##### Chemical crust

Salt: 0 percent

Gypsum: 0 percent

##### Physical cover

Canopy plant cover: 35 percent

Woody debris: 5 percent

Bare soil: 60 percent

Rock fragments:

- gravel: 5 percent

*Drainage class:* well drained

*Ksat solum:* 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

*Available water capacity total inches:* 7.1 (high)

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Loamy Upland 12-16" p.z.

*Ecological site number:* R041XC313AZ

*Present vegetation:* whitethorn acacia, black grama, tobosa, creosotebush, perennial forbs, sideoats grama, blue threeawn, desert zinnia, false mesquite, fluffgrass, mariola

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—St. David; about 1,500 feet south and 100 feet west of the northeast corner of section 31, Township 17 south, Range 22 east  
*Geographic Coordinate System:* 31° 54' 56.50" north, 110° 7' 45.00" west

A—0 to 2 inches (0 to 5 cm); strong brown (7.5YR 5/6) sandy loam, strong brown (7.5YR 4/6), moist; 10 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and few very fine vesicular pores; 5 percent gravel; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bt—2 to 10 inches (5 to 25 cm); yellowish red (5YR 4/6) sandy clay loam, reddish brown (5YR 4/4), moist; 25 percent clay; strong very fine, fine, and medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few fine roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; 5 percent gravel; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

Btk—10 to 19 inches (25 to 48 cm); 50 percent reddish brown (5YR 4/4) and 50 percent pink (5YR 8/3) sandy clay loam, yellowish red (5YR 4/6), moist; 25 percent clay; strong very fine, fine, and medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; few coarse roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; common medium carbonate masses; 5 percent gravel; violently effervescent, 7 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt wavy boundary.

Bk—19 to 60 inches (48 to 152 cm); pink (7.5YR 7/3) sandy loam, light brown (7.5YR 6/4), moist; 10 percent clay; moderate very fine and fine subangular blocky structure appearing massive in some places; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments and on faces of peds; common medium carbonate masses; 10 percent gravel; violently effervescent, 18 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 5 to 25 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 20 to 35 percent

#### A horizon

Hue: 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 to 6, dry or moist

Texture: sandy loam, loamy sand

#### Bt horizon

Hue: 5YR, 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 to 6, dry or moist

Texture: clay loam, sandy clay loam

Calcium carbonate equivalent: 0 to 5 percent

Btk and Bk horizons

Hue: 5YR, 7.5YR

Value: 4 to 8 dry, 3 to 6 moist

Chroma: 3 or 4 dry, 3 to 6 moist

Texture: sandy loam, clay loam, sandy clay loam

Calcium carbonate equivalent: 5 to 25 percent, averages more than 15 percent in the calcic horizons

## **57—Mabray-Rock outcrop complex, 5 to 70 percent slopes**

### **Map Unit Setting**

*Landform(s):* mountains

*Elevation:* 3,900 to 4,600 feet (1,189 to 1,402 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### **Map Unit Composition**

Mabray and similar soils: 70 percent

Rock outcrop: 25 percent

Minor components: Blakeney family, Riverwash

### **Soil Properties and Qualities**

#### **Mabray soils**

*Taxonomic classification:* Loamy-skeletal, carbonatic, thermic Lithic Ustic Torriorthents

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* slope alluvium derived from limestone

*Slope:* 5 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: 40 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

• gravel: 45 percent

• cobble: 35 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:* 0.8 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Limestone Hills 12-16" p.z.

*Ecological site number:* R041XC307AZ

*Present vegetation:* Schott's yucca, ocotillo, black grama, mariola, blue threeawn, sideoats grama

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Happy Valley; about 1,000 feet south and 300 feet east of the northwest corner of section 35, Township 14 south, Range 19 east

*Geographic Coordinate System:* 32° 10' 30.00" north, 110° 22' 45.00" west

AB—0 to 3 inches (0 to 8 cm); brown (7.5YR 5/3) very gravelly loam, dark brown (7.5YR 3/2), moist; 20 percent clay; weak thin platy parting to moderate very fine and fine subangular blocky structure; soft, very friable, slightly sticky and moderately plastic; few medium roots; many very fine tubular and irregular pores; many continuous distinct carbonate coats on rock fragments; 25 percent gravel and 10 percent cobble; violently effervescent, 40 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt wavy boundary.

Bk—3 to 9 inches (8 to 23 cm); brown (7.5YR 4/3) very cobbly loam, dark brown (7.5YR 3/3), moist; 20 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and moderately plastic; common very fine and fine and few medium roots; many very fine and fine irregular pores; many continuous distinct carbonate coats on rock fragments; 10 percent gravel and 45 percent cobble; violently effervescent, 45 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt wavy boundary.

R—9 to 60 inches (23 to 152 cm); unweathered limestone bedrock.

### Range in Characteristics

Rock fragments: 35 to 60 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 18 to 25 percent; ranges from 12 to 25 percent.

Calcium carbonate equivalent: greater than 40 percent based on whole soil less than 20 mm sieve.

#### AB horizon

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 2 or 3, dry or moist

Texture: loam, sandy loam

#### B horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3, dry or moist  
 Texture: loam, fine sandy loam, sandy loam

### **Rock outcrop**

Rock outcrop consists of barren rock that occurs as ledges, massive boulder piles, and nearly vertical cliffs of limestone. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the summit of mountains.

## **58—Magoffin-Budlamp-Rock outcrop complex, 5 to 70 percent slopes**

### **Map Unit Setting**

*Landform(s)*: hills and mountains  
*Elevation*: 4,600 to 6,500 feet (1,402 to 1,981 meters)  
*Mean annual precipitation*: 16 to 20 inches (406 to 508 millimeters)  
*Mean annual air temperature*: 57 to 62 degrees F (13.9 to 16.7 degrees C)  
*Mean annual soil temperature*: 59 to 64 degrees F (15.0 to 17.8 degrees C)  
*Frost-free period*: 160 to 210 days  
*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range  
*Land Resource Unit*: 41-1; Mexican Oak-Pine Woodland and Oak Savannah

### **Map Unit Composition**

Magoffin and similar soils: 45 percent  
 Budlamp and similar soils: 25 percent  
 Rock outcrop: 20 percent  
 Minor components: Cherrycow, Kuykendall, and soils with sandy clay loam textures

### **Soil Properties and Qualities**

#### **Magoffin soils**

*Taxonomic classification*: Loamy, mixed, superactive, thermic Aridic Lithic Haplustolls

*Geomorphic position*: generally on mountaintops and mountain flanks

*Parent material*: residuum and/or slope alluvium derived from andesite

*Slope*: 5 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: 40 percent

Woody debris: 5 percent

Bare soil: 40 percent

Rock fragments:

- gravel: 25 percent

- cobble: 15 percent

*Depth to restrictive feature(s)*: 5 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 0.01 inches per hour (0.00 to 0.07 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:* very high  
*Hydrologic group:* D  
*Ecological site name:* Volcanic Hills 16-20" p.z.  
*Ecological site number:* R041XA111AZ  
*Present vegetation:* sideoats grama, slender grama, plains lovegrass, hairy grama, wolftail, turpentine bush, broom snakeweed, green sprangletop, shrubby buckwheat, Palmer agave, Texas bluestem, bullgrass, perennial forbs  
*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Square Mountain; about 250 feet east and 500 feet north of the southwest corner of section 15, Township 13 south, Range 23 east

*Geographic Coordinate System:* 32° 17' 9.00" north, 110° 0' 0.00" west

A1—0 to 0.5 inch (0 to 1 cm); brown (7.5YR 4/2) sandy loam, dark brown (7.5YR 3/2), moist; 12 percent clay; weak thin platy parting to weak very fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; common very fine irregular pores; 10 percent gravel; noneffervescent; slightly acid, pH 6.4; abrupt smooth boundary.

A2—0.5 to 5 inches (1 to 13 cm); dark brown (7.5YR 3/2) loam, black (7.5YR 2.5/1), moist; 15 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; common very fine and fine roots; common very fine interstitial pores; 10 percent gravel; noneffervescent; slightly acid, pH 6.4; abrupt wavy boundary.

R—5 to 60 inches (13 to 152 cm); unweathered andesite bedrock.

### Range in Characteristics

Rock fragments: 0 to 20 percent

Organic matter: 1 to 3 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average percentage of clay in the control section: 5 to 18 percent

#### A horizons

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Texture: sandy loam, loam

#### Budlamp soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Aridic Lithic Haplustolls

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* residuum and/or slope alluvium derived from rhyolitic tuff

*Slope:* 5 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: 40 percent  
 Woody debris: 5 percent  
 Bare soil: 40 percent  
 Rock fragments:
 

- gravel: 25 percent
- cobble: 15 percent

*Depth to restrictive feature(s):* 5 to 20 inches to bedrock, lithic  
*Drainage class:* well drained  
*Ksat solum:* 0.57 to 5.95 inches per hour (4.00 to 42.00 micrometers per second)  
*Ksat restrictive layer:* 0.00 to 0.01 inches per hour (0.00 to 0.07 micrometers per second)  
*Available water capacity total inches:* 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:* Volcanic Hills 16-20" p.z.  
*Ecological site number:* R041XA111AZ  
*Present vegetation:* sideoats grama, slender grama, plains lovegrass, hairy grama, wolftail, turpentine bush, broom snakeweed, green sprangletop, shrubby buckwheat, Palmer agave, Texas bluestem, bullgrass, perennial forbs  
*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Square Mountain; about 1,050 feet east and 1,000 feet south of the northwest corner of section 22, Township 13 south, Range 23 east

*Geographic Coordinate System:* 32° 17' 37.00" north, 109° 59' 31.00" west

A1—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/2) very gravelly sandy loam, very dark brown (7.5YR 2.5/2), moist; 10 percent clay; weak fine granular parting to weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine tubular pores; 40 percent gravel; noneffervescent; slightly acid, pH 6.4; clear smooth boundary.

A2—2 to 12 inches (5 to 30 cm); brown (7.5YR 4/2) very gravelly loam, very dark brown (7.5YR 2.5/2), moist; 18 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine tubular pores; 50 percent gravel; noneffervescent; slightly acid, pH 6.4; abrupt wavy boundary.

R—12 to 60 inches (30 to 152 cm); unweathered rhyolitic tuff bedrock.

### Range in Characteristics

Rock fragments: 35 to 60 percent

Organic matter: 1 to 3 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average percentage of clay in the control section: 5 to 18 percent

**A horizons**

Hue: 7.5YR, 10YR  
 Value: 2 to 5 dry, 2 or 3 moist  
 Chroma: 1 to 3, dry or moist  
 Texture: sandy loam, loam

**Rock outcrop**

Rock outcrop consists of barren rock that occurs as ledges, massive rock piles, and nearly vertical cliffs of andesite and rhyolitic tuff. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the summit of hills and or mountains.

**59—Mallet-Hooks complex, 0 to 8 percent slopes****Map Unit Setting**

*Landform(s):* alluvial fans  
*Elevation:* 3,800 to 4,600 feet (1,158 to 1,402 meters)  
*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)  
*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)  
*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)  
*Frost-free period:* 180 to 230 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

**Map Unit Composition**

Mallet and similar soils: 50 percent  
 Hooks and similar soils: 30 percent  
 Minor components: Sasabe and soils containing greater than 35 percent rock fragments

**Soil Properties and Qualities****Mallet soils**

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Ustic Haplocambids  
*Geomorphic position:* tread  
*Parent material:* mixed fan 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: 65 percent  
 Woody debris: 15 percent  
 Bare soil: 10 percent  
 Rock fragments:  
 • gravel: 10 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:* 5.1 (moderate)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* very rare

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Sandy Loam 12-16" p.z. Deep

*Ecological site number:* R041XC318AZ

*Present vegetation:* mesquite, bush muhly, burroweed, plains bristlegrass, black grama, blue grama, Lehmann's lovegrass, annual forbs, annual grasses, perennial forbs, spidergrass

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Muskhog Mountain; about 800 feet east and 2,200 feet north of the southwest corner of section 28, Township 12 south, Range 23 east

*Geographic Coordinate System:* 32° 21' 36.40" north, 110° 0' 36.80" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) sandy loam, brown (7.5YR 4/4), moist; 8 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and slightly plastic; many very fine roots; many very fine irregular pores; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

Bw—2 to 22 inches (5 to 56 cm); brown (7.5YR 5/3) sandy loam, dark brown (7.5YR 3/4), moist; 8 percent clay; moderate very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few medium roots; many very fine tubular pores; 10 percent gravel; noneffervescent; neutral, pH 7.0; abrupt wavy boundary.

2C—22 to 60 inches (56 to 152 cm); brown (7.5YR 5/4) very gravelly sandy loam, brown (7.5YR 4/4), moist; 9 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and common medium roots; many very fine tubular pores; 40 percent gravel and 5 percent cobble; noneffervescent; neutral, pH 7.0.

### Range in Characteristics

Reaction: 6.6 to 7.3 (neutral)

Average percentage of clay in the control section: 5 to 18 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, loam

#### Bw horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, loam

Rock fragments: 0 to 10 percent

#### 2C horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam  
 Rock fragments: 35 to 60 percent

### **Hooks soils**

*Taxonomic classification:* Fine-loamy, mixed, superactive, thermic Ustic Haplocambids

*Geomorphic position:* tread

*Parent material:* mixed fan 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: 65 percent

Woody debris: 15 percent

Bare soil: 10 percent

Rock fragments:

- gravel: 10 percent

*Drainage class:* well drained

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

*Available water capacity total inches:* 6.8 (moderate)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* very rare

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Sandy Loam 12-16" p.z. Deep

*Ecological site number:* R041XC318AZ

*Present vegetation:* mesquite, bush muhly, burroweed, plains bristlegrass, black grama, blue grama, Lehmann's lovegrass, annual forbs, annual grasses, perennial forbs, spidergrass

*Land capability (nonirrigated):* 6c

### **Typical Profile**

#### *Location*

*Public Land Survey:* USGS Quadrangle—Muskhog Mountain; about 500 feet east and 2,000 feet south of the northwest corner of section 33, Township 12 south, Range 23 east

*Geographic Coordinate System:* 32° 21' 6.40" north, 110° 0' 30.50" west

A—0 to 1 inch (0 to 3 cm); brown (7.5YR 5/3) sandy loam, dark brown (7.5YR 3/4), moist; 8 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine vesicular pores; 5 percent gravel; noneffervescent; neutral, pH 7.0; abrupt smooth boundary.

Bw—1 to 24 inches (3 to 61 cm); brown (7.5YR 5/4) loam, dark brown (7.5YR 3/3), moist; 21 percent clay; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few very fine and few medium

roots; many very fine tubular and few very fine interstitial pores; 10 percent gravel; noneffervescent; neutral, pH 7.0; abrupt wavy boundary.

2C—24 to 60 inches (61 to 152 cm); light brown (7.5YR 6/4) very gravelly loam, dark brown (7.5YR 3/4), moist; 21 percent clay; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and medium roots; many very fine tubular pores; 35 percent gravel and 20 percent cobble; noneffervescent; neutral, pH 7.0.

### Range in Characteristics

Reaction: 6.6 to 7.3 (neutral)

Average percentage of clay in the control section: 18 to 35 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, loam

Rock fragments: 0 to 10 percent

#### Bw horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: loam, clay loam

Rock fragments: 0 to 10 percent

#### 2C horizon

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: loam, clay loam

Rock fragments: 35 to 60 percent

## 60—Mined land

Mined lands are areas where copper, gravel, or sand has been mined. These areas include actual mines, shafts, structures, borrow pits, tailings, excavations, product storage, waste rock piles, evaporation ponds, and disturbed areas. They also include exposed copper ore ready for mining, piles of lower grade ore used in leaching operations, and open excavations from which soils and geological material has been removed for use in copper or sand and gravel production. This unit describes all areas affected by active or past mining activities.

This material does not support vegetation because the topsoil has been removed. This unit has little or no value or potential for irrigated cropland, rangeland, or urban land development. Abandoned areas have moderate potential for wildlife habitat and rangeland if they are restored and reseeded. This unit is not placed in a capability classification because it is a miscellaneous landform.

Active and nonactive copper mines are located east of Benson, Arizona, on Johnson Camp Mine Road and the surrounding areas of Dragoon, Arizona.

Active and nonactive sand and gravel operations are located east of Benson, Arizona, on Johnson Camp Mine road and the surrounding areas of Dragoon, Arizona.

## 61—Mule-Paisano complex, 5 to 45 percent slopes

### Map Unit Setting

*Landform(s)*: fan terraces

*Elevation*: 3,800 to 4,800 feet (1,158 to 1,463 meters)

*Mean annual precipitation*: 12 to 16 inches (305 to 408 millimeters)

*Mean annual air temperature*: 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature*: 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period*: 180 to 230 days

*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range

*Land Resource Unit*: 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Mule and similar soils: 50 percent

Paisano and similar soils: 40 percent

Minor components: Blakeney family, Bodecker, Riverwash, Caralampi, Nolam

### Soil Properties and Qualities

#### Mule soils

*Taxonomic classification*: Loamy-skeletal, carbonatic, thermic Ustic Haplocalcids

*Geomorphic position*: side slopes

*Parent material*: mixed calcareous fan alluvium

*Slope*: 5 to 45 percent

*Surface cover*:

Biological crust

    Cyanobacteria: 0 percent

    Lichen: 0 percent

    Moss: 0 percent

Chemical crust

    Salt: 0 percent

    Gypsum: 0 percent

Physical cover

    Canopy plant cover: 40 percent

    Woody debris: 5 percent

    Bare soil: 5 percent

    Rock fragments:

        • gravel: 35 percent

        • cobble: 25 percent

*Drainage class*: well drained

*Ksat solum*: 0.57 to 1.98 inches per hour (4.00 to 14.00 micrometers per second)

*Available water capacity total inches*: 4.0 (low)

*Shrink-swell potential*: about 1.5 LEP (low)

*Flooding hazard*: none

*Runoff class*: high

*Hydrologic group*: B

*Ecological site name*: Limy Slopes 12-16" p.z.

*Ecological site number*: R041XC308AZ

*Present vegetation*: black grama, mariola, false mesquite, blue threeawn, creosotebush, desert zinnia, needlegrass, ocotillo, sacahuista, sandpaper plant, sotol

*Land capability (nonirrigated): 6c*

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 2,800 feet south and 300 feet east of the northwest corner of section 25, Township 14 south, Range 19 east

*Geographic Coordinate System:* 32° 11' 10.00" north, 110° 21' 40.00" west

A—0 to 3 inches (0 to 8 cm); light brown (7.5YR 6/3) very gravelly loam, brown (7.5YR 4/3), moist; 20 percent clay; weak very thin and thin platy parting to weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine interstitial pores; common continuous distinct carbonate coats on rock fragments; 35 percent gravel and 10 percent cobble; violently effervescent, 45 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk1—3 to 18 inches (8 to 46 cm); brown (7.5YR 5/3) very gravelly loam, brown (7.5YR 4/3), moist; 20 percent clay; weak very fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; common very fine irregular pores; many continuous distinct carbonate coats on rock fragments; 40 percent gravel and 15 percent cobble; violently effervescent, 50 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bk2—18 to 36 inches (46 to 91 cm); light brown (7.5YR 6/4) extremely gravelly loam, brown (7.5YR 5/4), moist; 20 percent clay; moderate fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; many very fine irregular and tubular pores; many continuous distinct carbonate coats on rock fragments; many fine carbonate masses; 50 percent gravel and 15 percent cobble; violently effervescent, 60 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk3—36 to 60 inches (91 to 152 cm); pink (7.5YR 7/4) and light brown (7.5YR 6/4) extremely gravelly loam, brown (7.5YR 5/4), moist; 20 percent clay; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine tubular and irregular pores; many continuous distinct carbonate coats on rock fragments; many fine carbonate masses; common fine carbonate nodules; 50 percent gravel and 20 percent cobble; violently effervescent, 50 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 35 to 70 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 5 to 25 percent

Calcium carbonate equivalent: greater than 40 percent based on whole soil less than 20 mm sieve.

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

Texture: loam, sandy loam

**Bk horizons**

Hue: 7.5YR, 10YR

Value: 5 to 8 dry, 4 to 7 moist

Chroma: 2 to 4, dry or moist

Texture: loam, fine sandy loam, sandy loam

**Paisano soils**

*Taxonomic classification:* Loamy-skeletal, carbonatic, thermic, shallow Calcic Petrocalcids

*Geomorphic position:* shoulders

*Parent material:* mixed calcareous fan alluvium

*Slope:* 5 to 45 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 40 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

- gravel: 35 percent

- cobble: 25 percent

*Depth to restrictive feature(s):* 10 to 20 inches to petrocalcic; 24 to 28 inches to cemented horizon

*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:* 1.1 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Limestone Hills 12-16" p.z.

*Ecological site number:* R041XC307AZ

*Present vegetation:* Schott's yucca, ocotillo, mariola, black grama, creosotebush, sideoats grama, false mesquite, blue threawn, javelin bush

*Land capability (nonirrigated):* 6c

**Typical Profile****Location**

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 2,200 feet south and 300 feet east of the northwest corner of section 25, Township 14 south, Range 19 east

*Geographic Coordinate System:* 32° 11' 16.00" north, 110° 21' 42.00" west

A—0 to 2 inches (0 to 5 cm); grayish brown (10YR 5/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2), moist; 14 percent clay; weak thin platy parting to weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and common medium roots; many very fine vesicular and interstitial

pores; many continuous distinct carbonate coats on rock fragments; 35 percent gravel and 10 percent cobble; violently effervescent, 47 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk—2 to 12 inches (5 to 31 cm); dark grayish brown (10YR 4/2) extremely gravelly loam, very dark grayish brown (10YR 3/2), moist; 14 percent clay; weak very fine subangular blocky parting to weak very fine granular structure; soft, very friable, slightly sticky and moderately plastic; many very fine and common medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 50 percent gravel and 15 percent cobble; violently effervescent, 60 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt wavy boundary.

2Bkm—12 to 25 inches (31 to 64 cm); cemented material, indurated (1/8- to ¼-inch thick laminar cap); cemented by calcium carbonates and silica; abrupt wavy boundary.

3Bkm—25 to 60 inches (64 to 152 cm); cemented material, weakly cemented gravels and cobbles; cemented by calcium carbonates within the matrix.

### Range in Characteristics

Rock fragments: 35 to 70 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 10 to 18 percent

Calcium carbonate equivalent: greater than 40 percent based on whole soil less than 20 mm sieve.

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 2 to 4, dry or moist

Texture: loam, sandy loam

#### Bk horizon

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

Texture: loam, fine sandy loam, sandy loam

#### Bkm horizon

Cemented: calcium carbonate

Hardness: strongly cemented to indurated

Thickness: 4 to 12 inches

## 62—Nolam-Stronghold complex, 5 to 30 percent slopes

### Map Unit Setting

*Landform(s):* fan terraces

*Elevation:* 3,900 to 4,600 feet (1,189 to 1,402 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Nolam and similar soils: 45 percent  
 Stronghold and similar soils: 35 percent  
 Minor components: Tombstone, Pedregosa, McAllister, Elgin

### Soil Properties and Qualities

#### Nolam soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Ustic  
 Calcic Argids

*Geomorphic position:* shoulders

*Parent material:* mixed fan alluvium

*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: 30 percent

Woody debris: 0 percent

Bare soil: 0 percent

Rock fragments:

- gravel: 45 percent

- cobble: 35 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:* 4.9 (low)

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Loamy Upland 12-16" p.z.

*Ecological site number:* R041XC313AZ

*Present vegetation:* slender grama, mesquite, hairy grama, annual grasses, cane beardgrass, sideoats grama, annual forbs, whitethorn acacia, mariola, bush muhly, ocotillo, perennial forbs, fluffgrass, soap tree yucca

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—San Pedro Ranch; about 1,600 feet west and 1,100 feet south of the northeast corner of section 14, Township 16 south, Range 21 east

*Geographic Coordinate System:* 32° 2' 53.40" north, 110° 10' 2.20" west

A—0 to 1.5 inches (0 to 4 cm); brown (7.5YR 5/4) extremely gravelly sandy loam, dark brown (7.5YR 3/3), moist; 14 percent clay; weak very fine platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots;

many very fine vesicular pores; 45 percent gravel and 25 percent cobble; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bt—1.5 to 16 inches (4 to 41 cm); reddish brown (5YR 4/4) very cobbly clay loam, reddish brown (5YR 4/4), moist; 28 percent clay; strong very fine and fine subangular blocky structure; slightly hard, firm, very sticky and very plastic; common medium and few coarse roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; 10 percent gravel and 45 percent cobble; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

Btk—16 to 24 inches (41 to 61 cm); yellowish red (5YR 5/6) extremely cobbly sandy clay loam, yellowish red (5YR 4/6), moist; 25 percent clay; strong very fine and fine subangular blocky structure; slightly hard, firm, very sticky and very plastic; few medium and coarse roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; many continuous distinct clay films on rock fragments and on faces of peds; 10 percent gravel and 50 percent cobble; slightly effervescent, 3 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bk—24 to 60 inches (61 to 152 cm); very pale brown (10YR 7/3) extremely cobbly clay loam, brown (10YR 5/3), moist; 30 percent clay; massive; hard, very firm, moderately sticky and moderately plastic; few very fine roots; many fine irregular pores; many continuous distinct carbonate coats on rock fragments; many fine and medium carbonate masses and nodules; 15 percent gravel and 45 percent cobble; violently effervescent, 42 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 35 to 70 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 18 to 35 percent

#### A horizon

Hue: 7.5YR

Value: 4 or 5 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

Texture: sandy loam, loam

#### Bt and Btk horizons

Hue: 2.5YR, 5YR

Value: 3 to 6 dry, 3 to 5 moist

Chroma: 3 to 6, dry or moist

Texture: clay loam, sandy clay loam

Calcium carbonate equivalent: 0 to 10 percent

#### Bk horizon

Hue: 10YR, 7.5YR

Value: 5 to 7, dry or moist

Chroma: 3 to 6, dry or moist

Texture: clay loam, sandy clay loam

Calcium carbonate equivalent: 15 to 45 percent

### Stronghold soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Ustic Haplocalcids

*Geomorphic position:* side slopes

*Parent material:* mixed calcareous fan alluvium

*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: 80 percent

  Woody debris: 5 percent

  Bare soil: 5 percent

  Rock fragments:

- gravel: 10 percent

*Drainage class:* well drained

*Ksat solum:* 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

*Available water capacity total inches:* 5.8 (moderate)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Limy Upland 12-16" p.z. Deep

*Ecological site number:* R041XC331AZ

*Present vegetation:* whitethorn acacia, creosotebush, mariola, bush muhly, annual forbs, fluffgrass, tarbush

*Land capability (nonirrigated):* 6c

### Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—San Pedro Ranch; about 600 feet west and 1,600 feet south of the northeast corner of section 14, Township 16 south, Range 21 east

*Geographic Coordinate System:* 32° 2' 38.00" north, 110° 9' 20.80" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) sandy loam, brown (7.5YR 4/3), moist; 8 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine vesicular pores; strongly effervescent, 4 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; clear smooth boundary.

Bk1—2 to 12 inches (5 to 30 cm); light brown (7.5YR 6/3) sandy loam, brown (7.5YR 4/3), moist; 13 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine and common medium roots; common very fine tubular pores; few continuous distinct carbonate coats on faces of peds; few very fine carbonate filaments; violently effervescent, 19 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Bk2—12 to 33 inches (30 to 84 cm); light brown (7.5YR 6/3) sandy loam, brown (7.5YR 5/3), moist; 8 percent clay; moderate very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine tubular pores; many continuous distinct carbonate coats on rock fragments and on faces of peds; common fine and medium carbonate masses; 5

percent gravel; violently effervescent, 19 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bk3—33 to 60 inches (84 to 152 cm); light brown (7.5YR 6/4) loamy sand, brown (7.5YR 5/4), moist; 7 percent clay; massive; very hard, very firm, nonsticky and nonplastic; many very fine and fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments and on faces of peds; 10 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 0 to 35 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 7 to 18 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3, dry or moist

Texture: sandy loam, fine sandy loam

Calcium carbonate equivalent: 1 to 10 percent

#### Bk horizons

Hue: 7.5YR, 10YR

Value: 4 to 7 dry, 3 to 6 moist

Chroma: 2 to 4, dry or moist

Texture: sandy loam, loamy sand

Calcium carbonate equivalent: 2 to 25 percent

## 63—Oxyaquic Torrifluents and Water, 0 to 5 percent slopes

### Map Unit Setting

*Landform(s):* flood plains

*Elevation:* 3,900 to 4,600 feet (1,189 to 1,402 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Stream Segment Properties and Qualities

Segment length: located in Bass and Hookers Hot Springs Canyons within the Muleshoe Ranch Preserve

Active flood plain width: 50 to 100 feet

Stream flow: perennial flow to intermittent

Flooding hazard: very frequent; long; 7 to 30 days

Flood month: July-September and January-March

Seasonal water table minimum depth: 0 to 25 inches

Water table kind: apparent

Water table present: year round

Bank entrenchment:

Percent cut: 90

Percent uncut: 10

Vertical cut: 5 to 20 feet; averages 6 to 8 feet

Depositional bar features: dynamic system of interbraided bars and channels that relocate with each major flood event; height varies with the depth and velocity of flood water

Meander pattern: irregular meander

Channel composition:

Bedrock percent: 0 to 5

Cobbles percent: 10 to 25

Gravel percent: 25 to 35

Sand percent: 40 to 65

Silt and clay percent: 0 to 10

Stability: a dynamic system of interbraided components that are generally degrading and aggrading

### Map Unit Composition

This is an undifferentiated map unit. These components are not consistently associated geographically. At least one component is present in every delineation, but each delineation can have any combination of the components. This map unit is not consistent over time. The components of this map unit consist of a dynamic, interbraided system of bars and channels. The active stream channel dynamics causes these components to shift locations. The stream channel meanders across the floodplain, degrading and scouring, leaving behind Riverwash and/or water. The channel also aggrades and revegetates, producing Oxyaquic Torrifluvents, depending on the velocity of the deposited sediments. This map unit has permanent surface water.

Minor components: soils that contain bedrock within 5 to 40 inches

### Soil Properties and Qualities

#### Oxyaquic Torrifluvents soils

*Taxonomic classification:* Oxyaquic Torrifluvents

*Geomorphic position:* dynamic system of interbraided bars and channels

*Parent material:* mixed stream alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 80 percent

Woody debris: 15 percent

Bare soil: 10 percent

Rock fragments:

- gravel: 20 percent

- cobble: 30 percent

- stone: 30 percent

- boulder: 5 percent

*Drainage class:* poorly drained  
*Ksat solum:* 19.98 to 39.69 inches per hour (141.00 to 280.00 micrometers per second)  
*Available water capacity total inches:* 1.2 (very low)  
*Shrink-swell potential:* about 1.5 LEP (low)  
*Flooding hazard:* frequent  
*Seasonal water table minimum depth:* about 10 to 79 inches  
*Runoff class:* negligible  
*Hydrologic group:* C  
*Ecological site name:* *Populus fremontii*-*Salix gooddingii*/*Muhlenbergia rigens*-*Anemopsis californica*  
*Ecological site number:* F041XC317AZ  
*Present vegetation:* Fremont cottonwood, Arizona sycamore, Goodding willow, Arizona black walnut, annual forbs, deergrass, seepwillow baccharis  
*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Hookers Hot Springs; about 1,400 feet west and 1,250 feet south of northeast corner of section 31, Township 12 south, Range 21 east

*Geographic Coordinate System:* 32° 21' 0.10" north, 110° 14' 12.30" west

C1—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/4) extremely cobbly coarse sand, very dark brown (7.5YR 2.5/2), moist; 5 percent clay; single grain; loose, nonsticky and nonplastic; many fine interstitial pores; 15 percent gravel and 45 percent cobble; noneffervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C2—2 to 14 inches (5 to 36 cm); brown (7.5YR 4/2) extremely cobbly coarse sand, very dark brown (7.5YR 2.5/2), moist; 5 percent clay; massive; loose, nonsticky and nonplastic; many very fine and fine and common medium roots; many fine interstitial pores; 10 percent gravel and 60 percent cobble; noneffervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

C3—14 to 23 inches (36 to 58 cm); brown (7.5YR 4/2) extremely cobbly coarse sand, very dark brown (7.5YR 2.5/2), moist; 5 percent clay; massive; loose, nonsticky and nonplastic; many very fine and common medium roots; many fine interstitial pores; 10 percent gravel and 60 percent cobble; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

C4—23 to 60 inches (58 to 152 cm); extremely cobbly coarse sand and water, very dark brown (7.5YR 2.5/2), moist; 5 percent clay; massive; loose, nonsticky and nonplastic; common medium roots; 10 percent gravel and 60 percent cobble; noneffervescent; slightly alkaline, pH 7.6.

### Range in Characteristics

Rock fragments: 35 to 75 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 1 to 8 percent

#### C horizons

Hue: 7.5YR

Value: 2 to 4, dry or moist

Chroma: 2 to 4, dry or moist

Texture: coarse sand, sandy loam, loamy sand, sand

**Water***Width:* 0 to 10 feet*Depth:* 0 to 36 inches**64—Pedregosa-Tombstone complex, 5 to 45 percent slopes****Map Unit Setting***Landform(s):* fan terraces*Elevation:* 3,900 to 4,600 feet (1,189 to 1,402 meters)*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)*Frost-free period:* 180 to 230 days*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland**Map Unit Composition**

Pedregosa and similar soils: 50 percent

Tombstone and similar soils: 40 percent

Minor components: Eloma, Caralampi, Nolam

**Soil Properties and Qualities****Pedregosa soils***Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic, shallow Calcic Petrocalcids*Geomorphic position:* shoulders*Parent material:* mixed calcareous fan alluvium*Slope:* 5 to 20 percent*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 35 percent

Woody debris: 5 percent

Bare soil: 30 percent

Rock fragments:

• gravel: 45 percent

• cobble: 15 percent

*Depth to restrictive feature(s):* 10 to 20 inches to petrocalcic*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:* 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:* Limy Upland 12-16" p.z.

*Ecological site number:* R041XC309AZ

*Present vegetation:* whitethorn acacia, black grama, creosotebush, ocotillo, mesquite, annual grasses, false mesquite, mariola, desert zinnia, fluffgrass, bush muhly, perennial forbs

*Land capability (nonirrigated):* 6c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—San Pedro Ranch; 2,150 feet north and 300 feet east of the southwest corner of section 26, Township 15 south, Range 21 east  
*Geographic Coordinate System:* 32° 6' 2.40" north, 110° 10' 49.20" west

A—0 to 1 inch (0 to 3 cm); brown (7.5YR 5/3) very gravelly sandy loam, brown (7.5YR 4/3), moist; 12 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine interstitial pores; common continuous distinct carbonate coats on rock fragments; 45 percent gravel and 10 percent cobble; violently effervescent, 10 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bk—1 to 13 inches (3 to 33 cm); brown (7.5YR 5/3) extremely gravelly loam, brown (7.5YR 4/3), moist; 14 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; many very fine and fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; 50 percent gravel and 10 percent cobble; violently effervescent, 20 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt wavy boundary.

Bkm—13 to 60 inches (33 to 152 cm); cemented material, indurated 1/4-inch thick laminar cap; cemented by calcium carbonates and silica.

### Range in Characteristics

Rock fragments: 40 to 60 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 5 to 18 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 2 to 4, dry or moist

Texture: loam, sandy loam

Calcium carbonate equivalent: 0 to 15 percent

#### Bk horizon

Hue: 7.5YR, 10YR

Value: 3 to 6 dry, 2 to 5 moist

Chroma: 2 to 4, dry or moist

Texture: loam, sandy loam

Calcium carbonate equivalent: 5 to 25 percent

#### Bkm horizon

Cemented: calcium carbonate

Hardness: very strongly cemented to indurated

Thickness: 1 foot to 5 feet

### **Tombstone soils**

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Ustic

Haplocalcids

*Geomorphic position:* side slopes

*Parent material:* mixed calcareous fan alluvium

*Slope:* 5 to 45 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 35 percent

Woody debris: 5 percent

Bare soil: 30 percent

Rock fragments:

- gravel: 45 percent

- cobble: 25 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:* 3.8 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Limy Slopes 12-16" p.z.

*Ecological site number:* R041XC308AZ

*Present vegetation:* whitethorn acacia, creosotebush, bush muhly, sideoats grama, mariola, black grama, desert zinnia, false mesquite, mintbush lippia, perennial forbs, whitestem paperflower

*Land capability (nonirrigated):* 6c

### **Typical Profile**

#### *Location*

*Public Land Survey:* USGS Quadrangle—San Pedro Ranch; about 2,000 feet north and 300 feet east of the southwest corner of section 26, Township 15 south, Range 21 east

*Geographic Coordinate System:* 32° 6' 2.30" north, 110° 10' 49.30" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/3) very gravelly sandy loam, dark brown (7.5YR 3/3), moist; 12 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and few coarse roots; many very fine interstitial pores; 35 percent gravel and 10 percent cobble; violently effervescent, 3 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Bk1—2 to 20 inches (5 to 51 cm); brown (7.5YR 4/3) very gravelly loam, dark brown (7.5YR 3/3), moist; 14 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and moderately plastic; many very fine and common medium roots; many very fine tubular pores; many continuous distinct

carbonate coats on rock fragments; 45 percent gravel and 10 percent cobble; violently effervescent, 14 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Bk2—20 to 33 inches (51 to 84 cm); brown (7.5YR 5/3) extremely gravelly sandy loam, brown (7.5YR 4/3), moist; 12 percent clay; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few coarse roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; 50 percent gravel and 10 percent cobble; violently effervescent, 24 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear wavy boundary.

Bk3—33 to 60 inches (84 to 152 cm); light brown (7.5YR 6/3) very gravelly sandy loam, brown (7.5YR 5/3), moist; 12 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 50 percent gravel; violently effervescent, 25 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 35 to 60 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 5 to 18 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 2 to 4, dry or moist

Texture: sandy loam, loam

Calcium carbonate equivalent: 1 to 10 percent

#### Bk horizons

Hue: 7.5YR, 10YR

Value: 4 to 7 dry, 3 to 5 moist

Chroma: 2 or 3, dry or moist

Texture: loam, sandy loam

Calcium carbonate equivalent: 15 to 40 percent

## 65—Queencreek-Riverwash complex, Chihuahuan, 0 to 5 percent slopes

### Map Unit Setting

*Landform(s)*: flood plains

*Elevation*: 2,900 to 3,800 feet (884 to 1,158 meters)

*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature*: 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period*: 190 to 260 days

*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range

*Land Resource Unit*: 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### Map Unit Composition

Queencreek, Chihuahuan, and similar soils: 65 percent

Riverwash, Chihuahuan: 20 percent

Minor components: Kokan, Yturbide, Agustin, Contention, Ugyyp

## Soil Properties and Qualities

### Queencreek, Chihuahuan soils

*Taxonomic classification:* Sandy-skeletal, mixed, thermic Typic Torrifuvents

*Geomorphic position:* higher and adjacent to Riverwash

*Parent material:* mixed stream alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 40 percent

Woody debris: 15 percent

Bare soil: 15 percent

Rock fragments:

- gravel: 25 percent

- cobble: 10 percent

*Drainage class:* excessively drained

*Ksat solum:* 19.98 to 39.69 inches per hour (141.00 to 280.00 micrometers per second)

*Available water capacity total inches:* 3.0 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* occasional

*Runoff class:* negligible

*Hydrologic group:* A

*Ecological site name:* Sandy Wash 8-12" p.z.

*Ecological site number:* R041XB213AZ

*Present vegetation:* mesquite, sideoats grama, catclaw acacia, Arizona cottontop, annual grasses, desert willow, bush muhly, netleaf hackberry, sand dropseed, singlewhorl burrobush

*Land capability (nonirrigated):* 7c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse Mtn; about 2,400 feet north and 600 feet east from southwest corner of section 16, Township 14 south, Range 20 east

*Geographic Coordinate System:* 32° 13' 6.00" north, 110° 18' 25.00" west

C1—0 to 13 inches (0 to 33 cm); brown (7.5YR 5/4) gravelly coarse sand, brown (7.5YR 4/4), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; 24 percent gravel; very slightly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Ck1—13 to 50 inches (33 to 127 cm); brown (7.5YR 5/4) very gravelly coarse sand, brown (7.5YR 4/4), moist; 4 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine and coarse roots; many very fine and fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 41 percent gravel and 5 percent cobble; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Ck2—50 to 60 inches (127 to 152 cm); brown (7.5YR 5/4) very gravelly coarse sand, brown (7.5YR 4/4), moist; 5 percent clay; massive; hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine and fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 45 percent gravel and 5 percent cobble; strongly effervescent; moderately alkaline, pH 8.0.

#### **Range in Characteristics**

Rock fragments: 20 to 60 percent, averages more than 35 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 1 to 10 percent

Calcium carbonate equivalent: 0 to 3 percent

C horizons

Hue: 10YR, 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: coarse sand, loamy coarse sand, sand, loamy sand, sandy loam

#### **Riverwash, Chihuahuan**

Riverwash consists of very deep, excessively drained, stratified sands, gravels, and cobbles from numerous sources. The materials are in the drainageways of this unit, commonly bordered by shallow to steep vertical banks cut into the alluvium. These materials are not stable and are subject to shifting and sorting. Riverwash is usually dry but can be transformed into a temporary watercourse or a short-lived torrent after a heavy rain within the watershed. These materials do not support vegetation because of the constant scouring and shifting they undergo.

### **66—Queencreek-Riverwash complex, Sonoran, 0 to 5 percent slopes**

#### **Map Unit Setting**

*Landform(s):* flood plains

*Elevation:* 2,900 to 3,800 feet (884 to 1,158 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 40; Sonoran Basin and Range

*Land Resource Unit:* 40-1; Upper Sonoran Desert Shrub

#### **Map Unit Composition**

Queencreek, Sonoran, and similar soils: 65 percent

Riverwash, Sonoran: 20 percent

Minor components: Kokan, Yturbide, Agustin

#### **Soil Properties and Qualities**

##### **Queencreek, Sonoran soils**

*Taxonomic classification:* Sandy-skeletal, mixed, thermic Typic Torrifuvents

*Geomorphic position:* higher and adjacent to Riverwash

*Parent material:* mixed stream alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 40 percent

Woody debris: 15 percent

Bare soil: 15 percent

Rock fragments:

• gravel: 25 percent

• cobble: 10 percent

*Drainage class:* excessively drained*Ksat solum:* 19.98 to 39.69 inches per hour (141.00 to 280.00 micrometers per second)*Available water capacity total inches:* 3.0 (low)*Shrink-swell potential:* about 1.5 LEP (low)*Flooding hazard:* occasional*Runoff class:* negligible*Hydrologic group:* A*Ecological site name:* Sandy Wash 10-13" p.z.*Ecological site number:* R040XA115AZ*Present vegetation:* mesquite, sideoats grama, catclaw acacia, Arizona cottontop, annual grasses, desert willow, netleaf hackberry, sand dropseed, bush muhly, singlewhorl burrobush*Land capability (nonirrigated):* 7c**Typical Profile***Location**Public Land Survey:* USGS Quadrangle—Wildhorse Mtn; about 2,400 feet north and 600 feet east from southwest corner of section 16, Township 14 south, Range 20 east*Geographic Coordinate System:* 32° 13' 6.00" north, 110° 18' 25.00" west

C1—0 to 13 inches (0 to 33 cm); brown (7.5YR 5/4) gravelly coarse sand, brown (7.5YR 4/4), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; 24 percent gravel; very slightly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Ck1—13 to 50 inches (33 to 127 cm); brown (7.5YR 5/4) very gravelly coarse sand, brown (7.5YR 4/4), moist; 4 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine and coarse roots; many very fine and fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 41 percent gravel and 5 percent cobble; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Ck2—50 to 60 inches (127 to 152 cm); brown (7.5YR 5/4) very gravelly coarse sand, brown (7.5YR 4/4), moist; 5 percent clay; massive; hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine and fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 45 percent gravel and 5 percent cobble; strongly effervescent; moderately alkaline, pH 8.0.

**Range in Characteristics**

Rock fragments: 20 to 60 percent, averages more than 35 percent

Reaction: 7.4–8.4 (slightly to moderately alkaline)  
 Average percentage of clay in the control section: 1 to 10 percent  
 Calcium carbonate equivalent: 0 to 3 percent

C horizons

Hue: 10YR, 7.5YR  
 Value: 4 to 6 dry, 3 to 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: coarse sand, loamy coarse sand, sand, loamy sand, sandy loam

**Riverwash, Sonoran**

Riverwash consists of very deep, excessively drained, stratified sands, gravels, and cobbles from numerous sources. The materials are in the drainageways of this unit, commonly bordered by shallow to steep vertical banks cut into the alluvium. These materials are not stable and are subject to shifting and sorting. Riverwash is usually dry but can be transformed into a temporary watercourse or a short-lived torrent after a heavy rain within the watershed. These materials do not support vegetation because of the constant scouring and shifting they undergo.

**67—Rafter-Riverwash complex, 0 to 5 percent slopes**

**Map Unit Setting**

*Landform(s):* flood plains  
*Elevation:* 4,600 to 5,600 feet (1,402 to 1,707 meters)  
*Mean annual precipitation:* 16 to 20 inches (406 to 508 millimeters)  
*Mean annual air temperature:* 57 to 62 degrees F (13.9 to 16.7 degrees C)  
*Mean annual soil temperature:* 59 to 64 degrees F (15.0 to 17.8 degrees C)  
*Frost-free period:* 160 to 210 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-1; Mexican Oak-Pinyon Woodland and Oak Savannah

**Map Unit Composition**

Rafter and similar soils: 65 percent  
 Riverwash: 30 percent  
 Minor components: Ashcreek soils and soils that contain 18 to 35 percent clay

**Soil Properties and Qualities**

**Rafter soils**

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Cumulic Haplustolls  
*Geomorphic position:* higher and adjacent to Riverwash  
*Parent material:* mixed stream alluvium  
*Slope:* 0 to 5 percent  
*Surface cover:*  
 Biological crust  
   Cyanobacteria: 0 percent  
   Lichen: 0 percent  
   Moss: 0 percent  
 Chemical crust  
   Salt: 0 percent  
   Gypsum: 0 percent  
 Physical cover  
   Canopy plant cover: 60 percent

Woody debris: 40 percent

Bare soil: 0 percent

Rock fragments:

- gravel: 10 percent
- cobble: 20 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:* 1.8 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* occasional

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Quercus-Juniperus deppeana/Muhlenbergia

*Ecological site number:* F041XA123AZ

*Present vegetation:* Emory oak, Arizona white oak, Arizona cypress, blue grama, Arizona sycamore, annual forbs, cane beardgrass, perennial forbs, sacahuista, sideoats grama, skunkbush sumac

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—The Mesas; about 2,800 feet west and 1,200 feet south of the northwest corner of section 11, Township 12 south, Range 21 east

*Geographic Coordinate System:* 32° 24' 33.20" north, 110° 10' 30.20" west

A—0 to 6 inches (0 to 15 cm); brown (7.5YR 4/2) cobbly loam, very dark brown (7.5YR 2.5/2), moist; 11 percent clay; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine irregular pores; 5 percent gravel and 20 percent cobble; noneffervescent; neutral, pH 6.6; gradual wavy boundary.

C—6 to 60 inches (15 to 152 cm); brown (7.5YR 4/2) extremely cobbly sandy loam, very dark brown (7.5YR 2.5/2), moist; 13 percent clay; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; common medium and few coarse roots; many very fine irregular pores; 30 percent gravel and 55 percent cobble; noneffervescent; neutral, pH 6.8.

### Range in Characteristics

Rock fragments: 25 to 85 percent, averages more than 35 percent

Organic matter: 1 to 3 percent, decreasing irregularly with depth

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average percentage of clay in control section: 5 to 18 percent

#### A and C horizons

Hue: 7.5YR, 10YR

Value: 3 or 4 dry or 2 or 3 moist

Chroma: 1 to 3, dry or moist

Texture: loam, sandy loam

#### Riverwash

Riverwash consists of very deep, excessively drained, stratified sands, gravel, and cobbles from numerous sources. This material is part of a dynamic interbraided system of bars and channels, commonly bordered by shallow to steep vertical cutbanks into the alluvium. This material is not stable and is subject to shifting and sorting. Riverwash is usually dry but can be transformed into a temporary

watercourse or a short-lived torrent after a heavy rain within the watershed. This material does not support vegetation because of the constant scouring and shifting it undergoes.

## **68—Redington-Ripsey-Rock outcrop association, 15 to 70 percent slopes**

### **Map Unit Setting**

*Landform(s):* Redington—fan terraces; Ripsey—hills

*Elevation:* 2,900 to 3,600 feet (884 to 1,097 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 40; Sonoran Basin and Range

*Land Resource Unit:* 40-1; Upper Sonoran Desert Shrub

### **Map Unit Composition**

Redington and similar soils: 35 percent

Ripsey and similar soils: 30 percent

Rock outcrop: 15 percent

Minor components: Riverwash

### **Soil Properties and Qualities**

#### **Redington soils**

*Taxonomic classification:* Sandy, mixed, thermic Typic Torriorthents

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* alluvium derived from calcareous conglomerate

*Slope:* 15 to 70 percent

*Surface cover:*

Biological crust

    Cyanobacteria: 0 percent

    Lichen: 0 percent

    Moss: 0 percent

Chemical crust

    Salt: 0 percent

    Gypsum: 0 percent

Physical cover

    Canopy plant cover: 65 percent

    Woody debris: 5 percent

    Bare soil: 5 percent

    Rock fragments:

        • gravel: 25 percent

*Depth to restrictive feature(s):* 10 to 20 inches to densic material

*Drainage class:* somewhat excessively drained

*Ksat solum:* 0.06 to 19.98 inches per hour (0.42 to 141.00 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:* C

*Ecological site name:* Limy Slopes 10-13" p.z.

*Ecological site number:* R040XA110AZ

*Present vegetation:* paloverde, creosotebush, bush muhly, desert zinnia, plains  
bristleglass, pricklypear, cholla, whitethorn acacia

*Land capability (nonirrigated):* 7c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Soza Canyon; about 500 feet east and 1,750 feet south of the northwest corner of section 8, Township 13 south, Range 19 east

*Geographic Coordinate System:* 32° 19' 28.00" north, 110° 25' 58.00" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/3) loamy sand, dark brown (7.5YR 3/3), moist; 7 percent clay; weak medium platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine and fine irregular pores; 5 percent gravel; strongly effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Ck—2 to 12 inches (5 to 30 cm); brown (7.5YR 5/3) loamy sand, brown (7.5YR 4/3), moist; 7 percent clay; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine and fine irregular pores; few continuous distinct carbonate coats on rock fragments; 5 percent gravel; violently effervescent, 9 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Cdk1—12 to 28 inches (30 to 71 cm); light brown (7.5YR 6/3) gravelly coarse sand, brown (7.5YR 4/3), moist; 5 percent clay; massive; hard, firm, nonsticky and nonplastic; few very fine roots; many very fine and fine irregular pores; common continuous distinct carbonate coats on rock fragments; many carbonate masses; 30 percent gravel; violently effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Cdk2—28 to 60 inches (71 to 152 cm); light brown (7.5YR 6/3) gravelly coarse sand, brown (7.5YR 5/3), moist; 5 percent clay; massive; very hard, very firm, nonsticky and nonplastic; few very fine roots; many very fine and fine irregular pores; common continuous distinct carbonate coats on rock fragments; many carbonate masses; 20 percent gravel; strongly effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 3 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: loamy sand, coarse sand, sandy loam

Calcium carbonate equivalent: 5 to 10 percent

#### C and Cd horizons

Hue: 7.5YR

Value: 4 to 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

Texture: coarse sand, loamy sand

Calcium carbonate equivalent: 5 to 10 percent

Gypsum content: 0 to 2 percent  
 Rock fragments: 0 to 35 percent

Dense sediments that are intergrades between soft sediments (C material) and soft bedrock (Cr material). These naturally compacted sediments have been subjected to a slow reduction in volume and increase in density from deep water loading in the geologic past. These materials easily break down in water, and roots can penetrate when moist. They are root restrictive when dry.

### **Ripsey soils**

*Taxonomic classification:* Loamy, mixed, superactive, calcareous, thermic Lithic Torriorthents

*Geomorphic position:* generally on crests and side slopes

*Parent material:* residuum and/or alluvium derived from calcareous conglomerate

*Slope:* 15 to 70 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 30 percent

Woody debris: 5 percent

Bare soil: 20 percent

Rock fragments:

- gravel: 35 percent
- cobble: 15 percent

*Depth to restrictive feature(s):* 10 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:* 1.2 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Conglomerate Hills 10-13" p.z.

*Ecological site number:* R040XA128AZ

*Present vegetation:* whitethorn acacia, black grama, catclaw acacia, bush muhly, purple threeawn, banana yucca, pricklypear, and cholla

*Land capability (nonirrigated):* 7c

### **Typical Profile**

*Location*

*Public Land Survey:* USGS Quadrangle—Soza Canyon; about 450 feet east and 200 feet south of the northwest corner of section 8, Township 19 south, Range 13 east

*Geographic Coordinate System:* 32° 19' 58.00" north, 110° 25' 50.00" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) gravelly sandy loam, brown (7.5YR 4/3), moist; 12 percent clay; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; few continuous distinct carbonate coats on rock fragments; 20 percent gravel; slightly

effervescent, 3 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; clear smooth boundary.

Bk—2 to 11 inches (5 to 28 cm); brown (7.5YR 4/3) gravelly sandy loam, dark brown (7.5YR 3/3), moist; 12 percent clay; weak very fine and fine subangular blocky structure and single grain; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; common continuous distinct carbonate coats on rock fragments; 30 percent gravel; strongly effervescent, 5 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt wavy boundary.

R—11 to 60 inches (28 to 152 cm); unweathered conglomerate bedrock.

### Range in Characteristics

Rock fragments: 10 to 35 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 7 to 15 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: loamy sand, sandy loam

#### Bk horizon

Hue: 7.5YR, 10YR

Value: 4 to 7 dry, 3 to 6 moist

Chroma: 3 or 4, dry or moist

Texture: loamy sand, sandy loam

Some pedons have thin weathered bedrock (Cr) less than 3 inches thick above the unweathered bedrock.

### Rock outcrop

Rock outcrop consists of barren rock that occurs as ledges, massive boulder piles, and nearly vertical cliffs of conglomerate bedrock. Rock outcrop also includes areas where the depth to bedrock is less than 4 inches. The higher percentage of rock outcrop is in areas near the summit of hills.

## 69—Romero-Nodman-Rock outcrop complex, 5 to 60 percent slopes

### Map Unit Setting

*Landform(s):* mountains

*Elevation:* 3,900 to 5,400 feet (1,189 to 1,646 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Romero and similar soils: 40 percent

Nodman and similar soils: 35 percent

Rock outcrop: 15 percent

Minor components: Lampshire, Andrada, Deloro, Chiricahua

### Soil Properties and Qualities

#### Romero soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, nonacid, thermic, shallow Ustic Torriorthents

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* slope alluvium derived from schist

*Slope:* 5 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: 40 percent

Woody debris: 5 percent

Bare soil: 40 percent

Rock fragments:

- channer: 55 percent

*Depth to restrictive feature(s):* 10 to 20 inches to bedrock, paralithic

*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:* 0.5 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* C

*Ecological site name:* Granitic Hills 12-16" p.z.

*Ecological site number:* R041XC306AZ

*Present vegetation:* ocotillo, whitethorn acacia, sideoats grama, mesquite, Palmer agave, black grama, false mesquite, perennial forbs, pricklypear, cholla, annual grasses, bush muhly

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—San Pedro Ranch; about 150 feet north and 1,400 feet west of the southeast corner of section 25, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 5' 40.00" north, 110° 14' 56.00" west

A1—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) very channery sandy loam, brown (7.5YR 4/3), moist; 10 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine irregular pores; 55 percent channer; noneffervescent; slightly acid, pH 6.4; clear smooth boundary.

A2—2 to 12 inches (5 to 30 cm); brown (7.5YR 4/3) extremely channery sandy loam, dark brown (7.5YR 3/3), moist; 12 percent clay; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine irregular pores; 70 percent channer; noneffervescent; neutral, pH 6.8; abrupt wavy boundary.

Cr—12 to 60 inches (30 to 152 cm); weathered schist bedrock.

### Range in Characteristics

Rock fragments: 35 to 70 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average percentage of clay in control section: 5 to 18 percent

#### A horizons

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 to 4, dry or moist

Texture: sandy loam

#### Nodman soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic, shallow Ustic Haplargids

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* slope alluvium derived from schist

*Slope:* 5 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: 40 percent

Woody debris: 5 percent

Bare soil: 40 percent

Rock fragments:

- channer: 55 percent

*Depth to restrictive feature(s):* 10 to 20 inches to bedrock, paralithic

*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 0.06 inches per hour (0.00 to 0.42 micrometers per second)

*Available water capacity total inches:* 0.6 (very low)

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* C

*Ecological site name:* Granitic Hills 12-16" p.z.

*Ecological site number:* R041XC306AZ

*Present vegetation:* ocotillo, whitethorn acacia, sideoats grama, mesquite, broom snakeweed, black grama, bush muhly, annual grasses, false mesquite, spidergrass, perennial forbs

*Land capability (nonirrigated):* 6c

## Typical Profile

### *Location*

*Public Land Survey:* USGS Quadrangle—San Pedro Ranch; about 1,000 feet west and 550 feet north of the southeast corner of section 25, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 5' 44.00" north, 110° 14' 51.00" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) very channery sandy loam, dark brown (7.5YR 3/3), moist; 12 percent clay; weak thin platy parting to weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; common continuous distinct clay films on bottom surfaces of rock fragments; 50 percent channer; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

Bt—2 to 12 inches (5 to 30 cm); dark reddish brown (5YR 3/3) extremely channery sandy clay loam, dark reddish brown (5YR 3/3), moist; 28 percent clay; strong very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and moderately plastic; common fine and medium and few coarse roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; 65 percent channer; noneffervescent; neutral, pH 6.6; abrupt wavy boundary.

Crt—12 to 20 inches (30 to 51 cm); many continuous distinct clay films in fractures; weathered schist bedrock.

Cr—20 to 60 inches (51 to 152 cm); weathered schist bedrock.

### Range in Characteristics

Rock fragments: 35 to 70 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average percentage of clay in control section: 20 to 35 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 to 5 dry, 2 or 3 moist

Chroma: 2 to 4, dry or moist

Texture: loam, sandy loam

#### B horizon

Hue: 7.5YR, 5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 2 to 4, dry or moist

Texture: sandy clay loam, loam, clay loam

#### Rock outcrop

Rock outcrop consists of barren rock that occurs as ledges, massive channer piles, and nearly vertical cliffs of schist. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the summit of mountains.

## 70—Romero-Oracle-Rock outcrop complex, 5 to 20 percent slopes

### Map Unit Setting

*Landform(s):* hills

*Elevation:* 3,900 to 5,400 feet (1,189 to 1,646 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)  
*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)  
*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)  
*Frost-free period:* 180 to 230 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Romero and similar soils: 40 percent  
 Oracle and similar soils: 25 percent  
 Rock outcrop: 25 percent  
 Minor components: Lampshire, Chiricahua, Durazo, Riverwash, and calcareous Romero soils.

### Soil Properties and Qualities

#### Romero soils

*Taxonomic classification:* Loamy, mixed, superactive, nonacid, thermic, shallow Ustic Torriorthents

*Geomorphic position:* generally on crests and side slopes

*Parent material:* slope alluvium derived from granite

*Slope:* 5 to 20 percent

#### *Surface cover:*

##### Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

##### Chemical crust

Salt: 0 percent

Gypsum: 0 percent

##### Physical cover

Canopy plant cover: 40 percent

Woody debris: 5 percent

Bare soil: 40 percent

Rock fragments:

- gravel: 15 percent

- cobble: 15 percent

*Depth to restrictive feature(s):* 5 to 20 inches to bedrock, paralithic

*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:* 1.2 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* C

*Ecological site name:* Granitic Upland 12-16" p.z.

*Ecological site number:* R041XC322AZ

*Present vegetation:* hairy grama, sideoats grama, black grama, mesquite, catclaw acacia, mimosa, perennial forbs, sacahuista, soaptree yucca, broom snakeweed, false mesquite, pricklypear, cholla, banana yucca, burroweed, bush muhly, shrubby buckwheat

*Land capability (nonirrigated):* 6c

## Typical Profile

### *Location*

*Public Land Survey:* USGS Quadrangle—Deepwell Ranch; about 250 feet west and 1,100 feet north of the southeast corner of section 29, Township 14 south, Range 21 east

*Geographic Coordinate System:* 32° 11' 17.00" north, 110° 13' 2.00" west

A1—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/2) sandy loam, very dark brown (7.5YR 2.5/2), moist; 10 percent clay; weak very fine granular structure; soft, very friable, nonsticky and slightly plastic; many very fine and fine roots; many very fine interstitial pores; 5 percent gravel; noneffervescent; slightly acid, pH 6.2; clear smooth boundary.

A2—2 to 11 inches (5 to 28 cm); brown (7.5YR 4/2) sandy loam, very dark brown (7.5YR 2.5/2), moist; 12 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and slightly plastic; many very fine and fine roots; many interstitial pores; 5 percent gravel; noneffervescent; slightly acid, pH 6.4; abrupt wavy boundary.

Cr1—11 to 15 inches (28 to 38 cm); many very fine roots in fractures; many continuous distinct organic stains on fractures; weathered granite bedrock.

Cr2—15 to 60 inches (38 to 152 cm); weathered granite bedrock.

## Range in Characteristics

Rock fragments: 0 to 35 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average percentage of clay in control section: 5 to 18 percent

### A horizons

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 2 to 4, dry or moist

Texture: sandy loam

Romero as used in this mapping unit is a taxadjunct to series because this soil contains less than 35 percent rock fragments in the control section. Romero series is Loamy-skeletal, mixed, superactive, nonacid, thermic, shallow Ustic Torriorthents.

### Oracle soils

*Taxonomic classification:* Loamy, mixed, superactive, thermic, shallow Ustic Haplargids

*Geomorphic position:* generally on crests and side slopes

*Parent material:* slope alluvium derived from granite

*Slope:* 5 to 20 percent

### *Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 40 percent

Woody debris: 5 percent

Bare soil: 40 percent

Rock fragments:

- gravel: 15 percent
- cobble: 15 percent

*Depth to restrictive feature(s):* 5 to 20 inches to bedrock, paralithic

*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 0.06 inches per hour (0.00 to 0.42 micrometers per second)

*Available water capacity total inches:* 1.4 (very low)

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* C

*Ecological site name:* Granitic Upland 12-16" p.z.

*Ecological site number:* R041XC322AZ

*Present vegetation:* hairy grama, sideoats grama, black grama, mesquite, bush muhly, mimosa, sacahuista, broom snakeweed, perennial forbs, pricklypear, cholla, burroweed, false mesquite, soaptree yucca, yerba de pasmo

*Land capability (nonirrigated):* 6c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Deepwell Ranch; about 350 feet west and 2,200 feet north of the southeast corner of section 29, Township 14 south, Range 21 east

*Geographic Coordinate System:* 32° 11' 16.00" north, 110° 13' 3.00" west

A—0 to 0.5 inch (0 to 1 cm); brown (7.5YR 4/4) sandy loam, dark brown (7.5YR 3/3), moist; 14 percent clay; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 10 percent gravel; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

Bt—0.5 to 10 inches (1 to 25 cm); reddish brown (5YR 4/3) sandy clay loam, dark reddish brown (5YR 3/3), moist; 30 percent clay; strong fine and medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; many very fine and fine roots; common very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; many continuous distinct clay bridges between sand grains; many continuous distinct organic stains on rock fragments and on faces of peds; 10 percent gravel; noneffervescent; neutral, pH 6.8; abrupt wavy boundary.

Crt—10 to 18 inches (25 to 46 cm); many continuous distinct organic stains in fractures; many continuous distinct clay films in fractures; weathered granite bedrock; abrupt wavy boundary.

Cr—18 to 60 inches (46 to 152 cm); weathered granite bedrock.

### Range in Characteristics

Rock fragments: 0 to 35 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average percentage of clay in control section: 18 to 35 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 3 or 4 dry or moist

Chroma: 2 to 4, dry or moist

Texture: sandy loam

**Bt horizon**

Hue: 7.5YR, 5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 2 to 4, dry or moist

Texture: loam, sandy clay loam

**Rock outcrop**

Rock outcrop consists of barren rock that occurs as ledges, massive boulder piles, and nearly vertical cliffs of granite. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the summit of hills.

## 71—Romero-Rock outcrop complex, 5 to 60 percent slopes

### Map Unit Setting

*Landform(s):* mountains

*Elevation:* 3,900 to 4,600 feet (1,189 to 1,402 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Romero and similar soils: 75 percent

Rock outcrop: 20 percent

Minor components: Lampshire, Nodman, Oracle

### Soil Properties and Qualities

#### Romero soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, nonacid, thermic, shallow Ustic Torriorthents

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* slope alluvium derived from granite

*Slope:* 5 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: 40 percent

Woody debris: 5 percent

Bare soil: 40 percent

Rock fragments:

- gravel: 70 percent
- cobble: 15 percent
- stone: 5 percent

*Depth to restrictive feature(s):* 5 to 20 inches to bedrock, paralithic; 20 to 60 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:* 0.4 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* C

*Ecological site name:* Granitic Hills 12-16" p.z.

*Ecological site number:* R041XC306AZ

*Present vegetation:* slender grama, annual grasses, sideoats grama, mesquite, black grama, pricklypear, cholla, whitethorn acacia, Palmer agave, ocotillo, perennial forbs, bush muhly, false mesquite

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 2,200 feet west and 400 feet north of the southeast corner of section 12, Township 15 south, Range 19 east

*Geographic Coordinate System:* 32° 8' 19.00" north, 110° 21' 14.00" west

A—0 to 5 inches (0 to 13 cm); brown (7.5YR 5/4) very gravelly sandy loam, very dark brown (7.5YR 2.5/2), moist; 12 percent clay; weak thin platy structure parting to single grain; loose, nonsticky and nonplastic; common very fine and few medium and coarse roots; many very fine irregular pores; 45 percent gravel; noneffervescent; slightly acid, pH 6.4; abrupt wavy boundary.

Cr—5 to 27 inches (13 to 69 cm); weathered granite bedrock.

R—27 to 60 inches (69 to 152 cm); unweathered granite bedrock.

### Range in Characteristics

Rock fragments: 35 to 60 percent

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Average clay content in the control section: 5 to 15 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 2 to 4, dry or moist

Texture: sandy loam

#### Rock outcrop

Rock outcrop consists of barren rock that occurs as ledges, massive boulder piles, and nearly vertical cliffs of granite. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the summit of mountains.

## 72—Sasabe sandy loam, 1 to 5 percent slopes

### Map Unit Setting

*Landform(s):* fan terraces

*Elevation:* 3,900 to 4,600 feet (1,189 to 1,402 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Sasabe and similar soils: 65 percent

Minor components: Stronghold, McAllister, Guest, and soils that contain a petrocalcic horizon below 30 inches

### Soil Properties and Qualities

#### Sasabe soils

*Taxonomic classification:* Fine, mixed, superactive, thermic Ustic Paleargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*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: 35 percent

    Woody debris: 10 percent

    Bare soil: 55 percent

    Rock fragments:

        • gravel: 5 percent

*Depth to restrictive feature(s):* 5 to 15 inches to abrupt textural change

*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:* 8.2 (high)

*Shrink-swell potential:* about 7.5 LEP (high)

*Flooding hazard:* none

*Runoff class:* medium

*Hydrologic group:* C

*Ecological site name:* Sandy Loam Upland 12-16" p.z.

*Ecological site number:* R041XC319AZ

*Present vegetation:* mesquite, bush muhly, annual forbs, annual grasses, plains  
bristlegrass, burroweed, black grama, perennial forbs, cane beardgrass, sideoats  
grama

*Land capability (nonirrigated):* 6c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—Square Mountain; about 1,050 feet west and 50 feet north of the southeast corner of section 36, Township 13 south, Range 23 east

*Geographic Coordinate System:* 32° 15' 11.00" north, 109° 56' 51.70" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 9 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; noneffervescent; neutral, pH 7.2; abrupt smooth boundary.

AB—2 to 10 inches (5 to 25 cm); brown (7.5YR 4/4) loam, dark brown (7.5YR 3/4), moist; 21 percent clay; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine interstitial pores; 5 percent gravel; noneffervescent; neutral, pH 7.2; abrupt smooth boundary.

Bt1—10 to 29 inches (25 to 74 cm); reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4), moist; 42 percent clay; strong very fine and fine angular blocky structure; extremely hard, firm, very sticky and very plastic; common very fine and fine roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

Bt2—29 to 60 inches (74 to 152 cm); reddish brown (5YR 4/4) gravelly clay, dark reddish brown (5YR 3/4), moist; 54 percent clay; strong fine and medium angular blocky structure; extremely hard, firm, very sticky and very plastic; common very fine roots; many very fine tubular pores; many continuous distinct clay films on rock fragments and on faces of peds; common distinct manganese coatings; 15 percent gravel; noneffervescent; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 0 to 25 percent

Reaction: 6.6 to 7.8 (neutral to slightly alkaline)

Average clay content in the control section: 35 to 60 percent

#### A and AB horizons

Hue: 7.5YR, 5YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, loam

#### Bt horizons

Hue: 2.5YR, 5YR

Value: 3 to 5, dry or moist

Chroma: 3 to 6, dry or moist

Texture: clay loam, sandy clay, clay

## 73—Sasabe-Courtland complex, 1 to 8 percent slopes

### Map Unit Setting

*Landform(s):* fan terraces

*Elevation:* 3,800 to 4,400 feet (1,158 to 1,341 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)  
*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)  
*Frost-free period:* 180 to 230 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Sasabe and similar soils: 55 percent  
 Courtland and similar soils: 30 percent  
 Minor components: Bodecker, Riverwash, Durazo, Diaspar, Libby, Gulch, Combate

### Soil Properties and Qualities

#### Sasabe soils

*Taxonomic classification:* Fine, mixed, superactive, thermic Ustic Paleargids  
*Geomorphic position:* generally on shoulders and side slopes  
*Parent material:* mixed fan alluvium  
*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  
*Depth to restrictive feature(s):* 3 to 15 inches to abrupt textural change  
*Drainage class:* well drained  
*Ksat solum:* 0.20 to 5.95 inches per hour (1.40 to 42.00 micrometers per second)  
*Available water capacity total inches:* 9.3 (high)  
*Shrink-swell potential:* about 4.5 LEP (moderate)  
*Flooding hazard:* none  
*Runoff class:* medium  
*Hydrologic group:* C  
*Ecological site name:* Loamy Upland 12-16" p.z.  
*Ecological site number:* R041XC313AZ  
*Present vegetation:* annual grasses, false mesquite, mesquite, sideoats grama, Rothrock's grama, feather fingergrass, tobosa, black grama, tanglehead  
*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County, Douglas-Tombstone Part, Arizona; USGS Quadrangle—Fort Huachuca; about 1,950 feet north and 2,800 feet west of the southeast corner of section 24, Township 22 south, Range 20 east  
*Geographic Coordinate System:* 31° 35' 33.00" north, 110° 16' 0.00" west  
 A—0 to 3 inches (0 to 8 cm); yellowish red (5YR 4/6) sandy loam, reddish brown (5YR 4/4), moist; 7 percent clay; moderate thin platy parting to moderate fine granular

structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common fine irregular pores; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

Bt1—3 to 11 inches (8 to 28 cm); red (2.5YR 4/6) sandy clay loam, dark red (2.5YR 3/6), moist; 32 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; few fine tubular pores; few continuous faint clay films between sand grains; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Bt2—11 to 36 inches (28 to 91 cm); dark reddish brown (2.5YR 3/4) clay loam, dark red (2.5YR 3/6), moist; 38 percent clay; moderate medium prismatic structure; slightly hard, friable, moderately sticky and moderately plastic; few very fine and fine roots; few fine tubular pores; common continuous distinct clay films on rock fragments; 10 percent gravel; noneffervescent; slightly alkaline, pH 7.8; gradual smooth boundary.

Bt3—36 to 60 inches (91 to 152 cm); red (2.5YR 4/6) sandy clay loam, red (2.5YR 4/6), moist; 27 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common fine roots; few fine tubular pores; many continuous distinct clay films on rock fragments, on faces of peds, and on surfaces along pores; 12 percent gravel; noneffervescent; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 5 to 25 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 35 to 60 percent

#### A horizon

Hue: 7.5YR, 5YR

Value: 3 to 5, dry or moist

Chroma: 4 to 8, dry or moist

Texture: sandy loam, sandy clay loam, silt loam, fine sandy loam

#### Bt horizons

Hue: 2.5YR, 5YR

Value: 3 to 5, dry or moist

Chroma: 3 to 6, dry or moist

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

Calcium carbonate equivalent: 0 to 15 percent

### Courtland soils

*Taxonomic classification:* Fine-loamy, mixed, superactive, thermic Ustic

Haplargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*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 5.95 inches per hour (1.40 to 42.00 micrometers per second)  
*Available water capacity total inches:* 7.8 (high)  
*Shrink-swell potential:* about 4.5 LEP (moderate)  
*Flooding hazard:* none  
*Runoff class:* low  
*Hydrologic group:* B  
*Ecological site name:* Sandy Loam Upland 12-16" p.z.  
*Ecological site number:* R041XC319AZ  
*Present vegetation:* annual grasses, false mesquite, mesquite, sideoats grama, Rothrock's grama, feather fingergrass, black grama, tanglehead  
*Land capability (nonirrigated):* 6c

### Typical Profile

#### *Location*

*Public Land Survey:* Typical pedon is from the Soil Survey of Cochise County; Douglas-Tombstone Part, Arizona; USGS Quadrangle—Elfrida; about 2,200 feet north and 1,600 feet east of the southwest corner of section 24, Township 20 south, Range 25 east

*Geographic Coordinate System:* 31° 40' 50.00" north, 109° 45' 10.00" west

A1—0 to 8 inches (0 to 20 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 8 percent clay; moderate medium platy parting to moderate fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots; common fine vesicular and few fine irregular pores; 5 percent gravel; noneffervescent; neutral, pH 7.0; clear smooth boundary.

A2—8 to 14 inches (20 to 36 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 12 percent clay; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine tubular pores; 5 percent gravel; noneffervescent; neutral, pH 7.0; clear wavy boundary.

Bt—14 to 20 inches (36 to 51 cm); reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4), moist; 15 percent clay; moderate fine subangular blocky structure; hard, friable, slightly sticky and nonplastic; few very fine roots; common fine tubular pores; few continuous faint clay films on surfaces along pores and clay bridges between sand grains; 5 percent gravel; noneffervescent; slightly alkaline, pH 7.5; clear wavy boundary.

Btk1—20 to 49 inches (51 to 124 cm); yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6), moist; 28 percent clay; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; few very fine roots; common fine tubular pores; common continuous faint clay films on surfaces along pores and clay bridges between sand grains; few fine carbonate masses; 5 percent gravel; slightly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

Btk2—49 to 60 inches (124 to 152 cm); red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6), moist; 28 percent clay; moderate medium subangular blocky structure; hard, friable, moderately sticky and slightly plastic; few very fine roots; common fine tubular pores; many continuous faint clay films on surfaces along pores and clay bridges between sand grains; few fine carbonate masses; 5 percent gravel; slightly effervescent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 5 to 35 percent  
 Reaction: 6.6 to 8.4 (neutral to moderately alkaline)  
 Average clay content in the control section: 18 to 35 percent

#### A horizon

Hue: 7.5YR, 5YR  
 Value: 4 to 6 dry, 3 to 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: fine sandy loam, sandy loam

#### Bt horizon

Hue: 2.5YR, 5YR  
 Value: 4 to 6, dry or moist  
 Chroma: 4 to 6, dry or moist  
 Texture: sandy clay loam, sandy loam

#### Btk horizons

Hue: 2.5YR, 5 YR  
 Value: 4 to 6, dry or moist  
 Chroma: 4 to 6, dry or moist  
 Texture: sandy clay loam, clay loam  
 Calcium carbonate equivalent: 0 to 15 percent

## 74—Schrap-Rock outcrop complex, 5 to 65 percent slopes

### Map Unit Setting

*Landform(s):* mountains  
*Elevation:* 3,800 to 4,800 feet (1,158 to 1,463 meters)  
*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)  
*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)  
*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)  
*Frost-free period:* 180 to 230 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Schrap and similar soils: 60 percent  
 Rock outcrop: 20 percent  
 Minor components: Oracle, Romero, Combate, Riverwash

### Soil Properties and Qualities

#### Schrap soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, nonacid, thermic, shallow Ustic Torriorthents  
*Geomorphic position:* generally on mountaintops and mountain flanks  
*Parent material:* slope alluvium derived from schist  
*Slope:* 5 to 65 percent  
*Surface cover:*  
 Biological crust  
 Cyanobacteria: 0 percent

Lichen: 0 percent  
 Moss: 0 percent  
 Chemical crust  
   Salt: 0 percent  
   Gypsum: 0 percent  
 Physical cover  
   Canopy plant cover: 40 percent  
   Woody debris: 5 percent  
   Bare soil: 5 percent  
   Rock fragments:  
     • channer: 65 percent  
     • flagstone: 15 percent  
*Depth to restrictive feature(s):* 12 to 25 inches to bedrock, paralithic; 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 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:* very high  
*Hydrologic group:* C  
*Ecological site name:* Granitic Hills 12-16" p.z.  
*Ecological site number:* R041XC306AZ  
*Present vegetation:* sideoats grama, jojoba, Arizona cottontop, black grama, ocotillo, broom snakeweed, purple grama, tanglehead, mesquite, Palmer agave, bush muhly, banana yucca, graythorn  
*Land capability (nonirrigated):* 6c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Soza Canyon; about 2,300 feet north and 2,050 feet east of the southwest corner of section 30, Township 13 south, Range 19 east

*Geographic Coordinate System:* 32° 16' 26.00" north, 110° 26' 38.00" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) very channery loam, brown (7.5YR 4/3), moist; 20 percent clay; weak very thin platy structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine irregular pores; 40 percent channer; noneffervescent; neutral, pH 7.2; abrupt wavy boundary.

C—2 to 14 inches (5 to 36 cm); reddish brown (5YR 4/3) very channery loam, dark reddish brown (5YR 3/3), moist; 20 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; many very fine and few coarse roots; many very fine irregular pores; 55 percent channer; noneffervescent; neutral, pH 7.2; clear wavy boundary.

Cr—14 to 22 inches (36 to 56 cm); weathered schist bedrock.

R—22 to 60 inches (56 to 152 cm); unweathered schist bedrock.

### Range in Characteristics

Rock fragments: 35 to 60 percent

Reaction: 6.6 to 7.3 (neutral)

Average percentage of clay in the control section: 18 to 25 percent

**A horizon**

Hue: 7.5YR, 10YR  
 Value: 4 to 6 dry, 3 or 4 moist  
 Chroma: 2 to 4, dry or moist  
 Texture: loam

**C horizon**

Hue: 7.5YR, 5YR  
 Value: 4 or 5 dry, 3 or 4 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: loam, clay loam

**Rock outcrop**

Rock outcrop consists of barren rock that occurs as ledges and nearly vertical cliffs of schist. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the summit of mountains.

## **75—Stagecoach-Pinaleno complex, Chihuahuan, 15 to 60 percent slopes**

### **Map Unit Setting**

*Landform(s):* fan terraces

*Elevation:* 2,900 to 3,800 feet (884 to 1,158 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### **Map Unit Composition**

Stagecoach, Chihuahuan and similar soils: 50 percent

Pinaleno, Chihuahuan and similar soils: 35 percent

Minor components: Ripsey, Delnorte, Bucklebar, and soils that contain argillic horizons above a petrocalcic, soils with sandy loam textures in the Bt horizons

### **Soil Properties and Qualities**

#### **Stagecoach, Chihuahuan soils**

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Typic Haplocalcids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed calcareous fan alluvium

*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: 35 percent

Woody debris: 5 percent

Bare soil: 30 percent

Rock fragments:

- gravel: 55 percent

- cobble: 5 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:* 3.2 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Limy Slopes 8-12" p.z.

*Ecological site number:* R041XB207AZ

*Present vegetation:* bush muhly, creosotebush, whitethorn acacia, mesquite, mintbush lippia, desert zinnia

*Land capability (nonirrigated):* 7c

## Typical Profile

### *Location*

*Public Land Survey:* USGS Quadrangle—Soza Canyon; about 1,900 feet south and 2,600 feet west of the northeast corner of section 4, Township 13 south, Range 19 east

*Geographic Coordinate System:* 32° 20' 20.30" north, 110° 24' 41.10" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) very gravelly sandy loam, dark brown (7.5YR 3/3), moist; 10 percent clay; weak thin platy parting to weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; 50 percent gravel; strongly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bk1—2 to 13 inches (5 to 33 cm); brown (7.5YR 4/3) very gravelly sandy loam, dark brown (7.5YR 3/3), moist; 17 percent clay; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; 45 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bk2—13 to 27 inches (33 to 69 cm); brown (7.5YR 5/3) very gravelly sandy loam, dark brown (7.5YR 3/3), moist; 16 percent clay; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and few medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 50 percent gravel and 5 percent cobble; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Bk3—27 to 60 inches (69 to 152 cm); light yellowish brown (10YR 6/4) extremely gravelly sandy loam, dark yellowish brown (10YR 4/4), moist; 11 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and few medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 55 percent gravel and 5 percent cobble; violently effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

## Range in Characteristics

Rock fragments: 35 to 60 percent

Reaction: 7.9 to 8.4 (moderately alkaline)

Average clay content in the control section: 5 to 18 percent

A horizon

Hue: 7.5YR  
 Value: 4 or 5 dry, 3 moist  
 Chroma: 3 dry, 3 or 4 moist  
 Texture: sandy loam

Bk horizons

Hue: 7.5YR, 10YR  
 Value: 4 to 6 dry, 3 or 4 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: sandy loam  
 Calcium carbonate equivalent: 5 to 15 percent

**Pinaleno, Chihuahuan soils**

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Typic Calciargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*Slope:* 15 to 45 percent

*Surface cover:*

Biological crust  
 Cyanobacteria: 0 percent  
 Lichen: 0 percent  
 Moss: 0 percent  
 Chemical crust  
 Salt: 0 percent  
 Gypsum: 0 percent  
 Physical cover  
 Canopy plant cover: 35 percent  
 Woody debris: 5 percent  
 Bare soil: 30 percent  
 Rock fragments:  
 • gravel: 55 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:* 3.4 (low)

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Loamy Upland 8-12" p.z.

*Ecological site number:* R041XB210AZ

*Present vegetation:* annual grasses, creosotebush, whitethorn acacia, bush muhly, desert zinnia, ocotillo, perennial forbs, range ratany, tobosa, Arizona cottontop, pricklypear, and cholla

*Land capability (nonirrigated):* 7c

**Typical Profile**

*Location*

*Public Land Survey:* USGS Quadrangle—Soza Canyon; about 1,700 feet south and 2,500 feet west of the northeast corner of section 4, Township 13 south, Range 19 east

*Geographic Coordinate System:* 32° 20' 21.30" north, 110° 24' 40.60" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/4) very gravelly sandy loam, dark brown (7.5YR 3/4), moist; 13 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 40 percent gravel; noneffervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

Bt—2 to 22 inches (5 to 56 cm); reddish brown (5YR 4/3) very gravelly sandy clay loam, dark reddish brown (5YR 3/4), moist; 22 percent clay; moderate very fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many fine tubular pores; many continuous distinct clay films on rock fragments; 40 percent gravel and 15 percent cobble; noneffervescent; slightly alkaline, pH 7.6; abrupt wavy boundary.

Btk—22 to 60 inches (56 to 152 cm); brown (7.5YR 5/3) extremely gravelly sandy loam, brown (7.5YR 4/4), moist; 16 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine and few medium roots; many fine tubular pores; many continuous distinct clay films on rock fragments; many continuous distinct carbonate coats on rock fragments; 50 percent gravel and 10 percent cobble; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

### Range in Characteristics

Rock fragments: 35 to 65 percent

Average clay content in the control section: 18 to 35 percent

#### A horizon

Hue: 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam

Reaction: 7.4 to 7.8 (slightly alkaline)

#### Bt horizon

Hue: 5YR, 7.5YR

Value: 4 to 5 dry, 3 to 4 moist

Chroma: 3 to 6, dry or moist

Texture: loam, sandy clay loam, clay loam

Reaction: 7.4 to 7.8 (slightly alkaline)

#### Btk horizon

Hue: 5YR, 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 to 4 dry, 3 to 6 moist

Texture: loam, sandy clay loam

Reaction: 7.9 to 8.4 (moderately alkaline)

Calcium carbonate equivalent: 8 to 20 percent

## 76—Stagecoach-Pinaleno complex, Sonoran, 15 to 60 percent slopes

### Map Unit Setting

*Landform(s)*: fan terraces

*Elevation*: 2,900 to 3,800 feet (884 to 1,158 meters)

*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 40; Sonoran Basin and Range

*Land Resource Unit:* 40-1; Upper Sonoran Desert Shrub

### Map Unit Composition

Stagecoach, Sonoran and similar soils: 50 percent

Pinaleno, Sonoran and similar soils: 35 percent

Minor components: Kokan, Ripsey, Delnorte, and soils that contain argillic horizons above a petrocalcic, soils with sandy loam textures in the Bt horizons.

### Soil Properties and Qualities

#### Stagecoach, Sonoran soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Typic Haplocalcids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed calcareous fan alluvium

*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: 35 percent

    Woody debris: 5 percent

    Bare soil: 30 percent

    Rock fragments:

        • gravel: 55 percent

        • cobble: 5 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:* 3.2 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Limy Slopes 10-13" p.z.

*Ecological site number:* R040XA110AZ

*Present vegetation:* whitethorn acacia, paloverde, creosotebush, desert zinnia, pricklypear, cholla, blue threeawn, bush muhly, mesquite, annual grasses, black grama, slim tridens, spidergrass

*Land capability (nonirrigated):* 7c

### Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—Soza Canyon; about 1,900 feet south and 2,600 feet west of northeast corner of section 4, Township 13 south, Range 19 east

*Geographic Coordinate System:* 32° 20' 20.30" north, 110° 24' 41.10" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) very gravelly sandy loam, dark brown (7.5YR 3/3), moist; 10 percent clay; weak thin platy parting to weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; 50 percent gravel; strongly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bk1—2 to 13 inches (5 to 33 cm); brown (7.5YR 4/3) very gravelly sandy loam, dark brown (7.5YR 3/3), moist; 17 percent clay; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; 45 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bk2—13 to 27 inches (33 to 69 cm); brown (7.5YR 5/3) very gravelly sandy loam, dark brown (7.5YR 3/3), moist; 16 percent clay; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and few medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 50 percent gravel and 5 percent cobble; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Bk3—27 to 60 inches (69 to 152 cm); light yellowish brown (10YR 6/4) extremely gravelly sandy loam, dark yellowish brown (10YR 4/4), moist; 11 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and few medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 55 percent gravel and 5 percent cobble; violently effervescent, 12 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

#### Range in Characteristics

Rock fragments: 35 to 60 percent

Reaction: 7.9 to 8.4 (moderately alkaline)

Average clay content in the control section: 5 to 18 percent

#### A horizon

Hue: 7.5YR

Value: 4 or 5 dry, 3 moist

Chroma: 3 dry, 3 or 4 moist

Texture: sandy loam

#### Bk horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam

Calcium carbonate equivalent: 5 to 15 percent

#### Pinaleno, Sonoran soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Typic

Calciargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*Slope:* 15 to 45 percent

#### *Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

**Chemical crust**

Salt: 0 percent

Gypsum: 0 percent

**Physical cover**

Canopy plant cover: 35 percent

Woody debris: 5 percent

Bare soil: 30 percent

Rock fragments:

- gravel: 55 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:* 3.4 (low)*Shrink-swell potential:* about 4.5 LEP (moderate)*Flooding hazard:* none*Runoff class:* high*Hydrologic group:* B*Ecological site name:* Loamy Slopes 10-13" p.z.*Ecological site number:* R040XA113AZ*Present vegetation:* paloverde, whitethorn acacia, creosotebush, black grama, bush muhly, perennial forbs, blue threeawn, saguaro, slim tridens*Land capability (nonirrigated):* 7c**Typical Profile***Location**Public Land Survey:* USGS Quadrangle—Soza Canyon; about 1,700 feet south and 2,500 feet west of the northeast corner of section 4, Township 13 south, Range 19 east*Geographic Coordinate System:* 32° 20' 21.30" north, 110° 24' 40.60" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/4) very gravelly sandy loam, dark brown (7.5YR 3/4), moist; 13 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 40 percent gravel; noneffervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

Bt—2 to 22 inches (5 to 56 cm); reddish brown (5YR 4/3) very gravelly sandy clay loam, dark reddish brown (5YR 3/4), moist; 22 percent clay; moderate very fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many fine tubular pores; many continuous distinct clay films on rock fragments; 40 percent gravel and 15 percent cobble; noneffervescent; slightly alkaline, pH 7.6; abrupt wavy boundary.

Btk—22 to 60 inches (56 to 152 cm); brown (7.5YR 5/3) extremely gravelly sandy loam, brown (7.5YR 4/4), moist; 16 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine and few medium roots; many fine tubular pores; many continuous distinct clay films on rock fragments; many continuous distinct carbonate coats on rock fragments; 50 percent gravel and 10 percent cobble; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

**Range in Characteristics**

Rock fragments: 35 to 65 percent

Average clay content in the control section: 18 to 35 percent

**A horizon**

Hue: 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist  
 Texture: sandy loam  
 Reaction: 7.4 to 7.8 (slightly alkaline)

**Bt horizon**

Hue: 5YR, 7.5YR  
 Value: 4 to 5 dry, 3 to 4 moist  
 Chroma: 3 to 6, dry or moist  
 Texture: loam, sandy clay loam, clay loam  
 Reaction: 7.4 to 7.8 (slightly alkaline)

**Btk horizon**

Hue: 5YR, 7.5YR  
 Value: 5 or 6 dry, 4 or 5 moist  
 Chroma: 2 to 4 dry, 3 to 6 moist  
 Texture: loam, sandy clay loam  
 Reaction: 7.9 to 8.4 (moderately alkaline)  
 Calcium carbonate equivalent: 8 to 20 percent

**77—Stagecoach-Whitlock-Delnorte complex,  
 Chihuahuan, 5 to 20 percent slopes**

**Map Unit Setting**

*Landform(s):* fan terraces  
*Elevation:* 3,600 to 3,800 feet (1,097 to 1,158 meters)  
*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)  
*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)  
*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)  
*Frost-free period:* 190 to 260 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-2; Chihuahuan-Sonoran Desert Shrub Mix

**Map Unit Composition**

Stagecoach, Chihuahuan, and similar soils: 40 percent  
 Whitlock, Chihuahuan, and similar soils: 25 percent  
 Delnorte, Chihuahuan, and similar soils: 20 percent  
 Minor components: Redo, Pinaleno, Kokan

**Soil Properties and Qualities**

**Stagecoach, Chihuahuan soils**

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Typic  
 Haplocalcids  
*Geomorphic position:* side slopes  
*Parent material:* mixed calcareous fan alluvium  
*Slope:* 5 to 20 percent  
*Surface cover:*  
 Biological crust  
 Cyanobacteria: 0 percent  
 Lichen: 0 percent  
 Moss: 0 percent  
 Chemical crust  
 Salt: 0 percent

Gypsum: 0 percent  
 Physical cover  
 Canopy plant cover: 40 percent  
 Woody debris: 5 percent  
 Bare soil: 15 percent  
 Rock fragments:  
 • gravel: 55 percent  
 • cobble: 20 percent  
 • stone: 10 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:* 4.6 (low)  
*Shrink-swell potential:* about 1.5 LEP (low)  
*Flooding hazard:* none  
*Runoff class:* medium  
*Hydrologic group:* B  
*Ecological site name:* Limy Slopes 8-12" p.z.  
*Ecological site number:* R041XB207AZ  
*Present vegetation:* creosotebush, bush muhly, whitethorn acacia, mintbush lippia, mesquite, desert zinnia, perennial forbs  
*Land capability (nonirrigated):* 7c

### Typical Profile

#### *Location*

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 2,350 feet north and 2,400 feet east of the southwest corner of section 10, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 8' 36.80" north, 110° 17' 17.70" west

A—0 to 3 inches (0 to 8 cm); brown (7.5YR 5/3) very cobbly sandy loam, brown (7.5YR 4/3), moist; 10 percent clay; weak medium and thick platy structure parting to single grain; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 10 percent gravel and 35 percent cobble; slightly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bk1—3 to 18 inches (8 to 46 cm); light brown (7.5YR 6/3) very cobbly sandy loam, brown (7.5YR 5/3), moist; 8 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 10 percent gravel and 30 percent cobble; violently effervescent, 9 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk2—18 to 46 inches (46 to 117 cm); light brown (7.5YR 6/4) very gravelly sandy loam, brown (7.5YR 5/4), moist; 8 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 30 percent gravel and 10 percent cobble; violently effervescent, 9 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bk3—46 to 60 inches (117 to 152 cm); brown (7.5YR 5/4) gravelly sandy loam, strong brown (7.5YR 4/6), moist; 9 percent clay; massive; hard, friable, nonsticky and nonplastic; many very fine and fine roots; common very fine tubular pores; many continuous distinct carbonate coats on rock fragments; many medium carbonate

masses; 20 percent gravel; strongly effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

### Range in Characteristics

Rock fragments: 20 to 60 percent, averages more than 35 percent

Reaction: 7.9 to 78.4 (moderately alkaline)

Average clay content in the control section: 5 to 15 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: loamy sand, sandy loam

Calcium carbonate equivalent: 1 to 5 percent

#### Bk horizons

Hue: 7.5YR, 10YR

Value: 4 to 7 dry, 3 to 5 moist

Chroma: 3 to 6, dry or moist

Texture: coarse sandy loam, sandy loam

Calcium carbonate equivalent: 5 to 20 percent

### Whitlock, Chihuahuan soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Typic Haplocalcids

*Geomorphic position:* side slopes

*Parent material:* mixed calcareous fan alluvium

*Slope:* 5 to 20 percent

#### *Surface cover:*

##### Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

##### Chemical crust

Salt: 0 percent

Gypsum: 0 percent

##### Physical cover

Canopy plant cover: 40 percent

Woody debris: 5 percent

Bare soil: 15 percent

Rock fragments:

- gravel: 65 percent

- cobble: 15 percent

*Drainage class:* well drained

*Ksat solum:* 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

*Available water capacity total inches:* 6.5 (moderate)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* medium

*Hydrologic group:* B

*Ecological site name:* Limy Fan 8-12" p.z.

*Ecological site number:* R041XB206AZ

*Present vegetation:* creosotebush, bush muhly, whitethorn acacia, mesquite, desert zinnia, perennial forbs

*Land capability (nonirrigated):* 7c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 2,200 feet north and 2,400 feet east of the southwest corner of section 10, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 8' 37.70" north, 110° 17' 17.70" west

A—0 to 3 inches (0 to 8 cm); light brown (7.5YR 6/3) gravelly sandy loam, brown (7.5YR 4/3), moist; 9 percent clay; moderate medium and thick platy structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine vesicular and interstitial pores; many continuous distinct carbonate coats on rock fragments; 20 percent gravel and 5 percent cobble; slightly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bk1—3 to 15 inches (8 to 38 cm); light brown (7.5YR 6/3) sandy loam, brown (7.5YR 4/3), moist; 11 percent clay; weak very fine subangular blocky structure parting to single grain; soft, very friable, slightly sticky and nonplastic; many very fine and fine and common medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments and on faces of peds; many medium carbonate masses; 10 percent gravel; violently effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk2—15 to 35 inches (38 to 89 cm); light brown (7.5YR 6/3) sandy loam, brown (7.5YR 4/3), moist; 9 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments and on faces of peds; many medium carbonate masses; 10 percent gravel; violently effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bk3—35 to 60 inches (89 to 152 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 9 percent clay; massive; extremely hard, firm, nonsticky and nonplastic; few very fine and medium roots; many very fine tubular pores; many continuous distinct carbonate coats on faces of peds; many medium carbonate masses; 5 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

### Range in Characteristics

Rock fragments: 5 to 35 percent

Reaction: 7.9 to 8.4 (moderately alkaline)

Average clay content in the control section: 5 to 15 percent

Calcium carbonate equivalent: 2 to 15 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

Texture: loam, sandy loam

#### Bk horizons

Hue: 7.5YR, 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

Texture: loam, sandy loam

**Delnorte, Chihuahuan soils**

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic, shallow Calcic Petrocalcids

*Geomorphic position:* shoulders

*Parent material:* mixed calcareous fan alluvium

*Slope:* 5 to 20 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 35 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

- gravel: 65 percent

- cobble: 15 percent

- stone: 5 percent

*Depth to restrictive feature(s):* 5 to 20 inches to petrocalcic

*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:* 0.8 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Limy Upland 8-12" p.z.

*Ecological site number:* R041XB208AZ

*Present vegetation:* creosotebush, mintbush lippia, ocotillo, annual grasses, fluffgrass, mariola

*Land capability (nonirrigated):* 7c

**Typical Profile**

*Location*

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 1,300 feet west and 550 feet south of the northeast corner of section 10, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 9' 0.50" north, 110° 16' 58.80" west

A—0 to 1 inch (0 to 3 cm); brown (10YR 5/3) very gravelly sandy loam, brown (10YR 4/3), moist; 7 percent clay; weak very fine and fine subangular blocky parting to weak very fine and fine granular structure; soft, loose, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; common patchy prominent carbonate coats on rock fragments; 45 percent gravel and 5 percent cobble; violently effervescent, 17 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bk—1 to 13 inches (3 to 33 cm); light gray (10YR 7/2) very gravelly coarse sandy loam, brown (10YR 5/3), moist; 7 percent clay; weak very fine and fine subangular blocky structure parting to single grain; loose, nonsticky and nonplastic; many very fine and fine and few medium and coarse roots; many very fine interstitial pores; many patchy prominent carbonate coats on rock fragments; many fine carbonate masses; 45 percent gravel and 5 percent cobble; violently effervescent, 17 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; very abrupt wavy boundary.

Bkm—13 to 60 inches (33 to 152 cm); cemented material, petrocalcic; very strongly cemented; cemented by carbonate.

### Range in Characteristics

Rock fragments: 35 to 60 percent  
 Reaction: 7.9 to 8.4 (moderately alkaline)  
 Clay content: 5 to 15 percent  
 Calcium carbonate equivalent: 5 to 20 percent

#### A horizon

Hue: 7.5YR, 10YR  
 Value: 4 or 5 dry, 3 to 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: sandy loam

#### Bk horizons

Hue: 7.5YR, 10YR  
 Value: 5 to 7 dry, 4 or 5 moist  
 Chroma: 2 or 3, dry or moist  
 Texture: coarse sandy loam, sandy loam

#### Bkm horizon

Cemented: calcium carbonate  
 Hardness: very strongly cemented to indurated  
 Thickness: 1 foot to 3 feet

## 78—Stagecoach-Whitlock-Delnorte complex, Sonoran, 5 to 20 percent slopes

### Map Unit Setting

*Landform(s):* fan terraces  
*Elevation:* 3,600 to 3,800 feet (1,097 to 1,158 meters)  
*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)  
*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)  
*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)  
*Frost-free period:* 190 to 260 days  
*Major Land Resource Area:* 40; Sonoran Basin and Range  
*Land Resource Unit:* 40-1; Upper Sonoran Desert Shrub

### Map Unit Composition

Stagecoach, Sonoran, and similar soils: 40 percent  
 Whitlock, Sonoran, and similar soils: 25 percent  
 Delnorte, Sonoran, and similar soils: 20 percent  
 Minor components: Redo, Pinaleno, Kokan

## Soil Properties and Qualities

### Stagecoach, Sonoran soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Typic Haplocalcids

*Geomorphic position:* side slopes

*Parent material:* mixed calcareous fan alluvium

*Slope:* 5 to 20 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 40 percent

Woody debris: 5 percent

Bare soil: 15 percent

Rock fragments:

- gravel: 55 percent

- cobble: 20 percent

- stone: 10 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:* 4.6 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* medium

*Hydrologic group:* B

*Ecological site name:* Limy Upland 10-13" p.z. Deep

*Ecological site number:* R040XA106AZ

*Present vegetation:* creosotebush, bush muhly, whitethorn acacia, mintbush lippia, mesquite, desert zinnia, perennial forbs

*Land capability (nonirrigated):* 7c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 2,350 feet north and 2,400 feet east of the southwest corner of section 10, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 8' 36.80" north, 110° 17' 17.70" west

A—0 to 3 inches (0 to 8 cm); brown (7.5YR 5/3) very cobbly sandy loam, brown (7.5YR 4/3), moist; 10 percent clay; weak medium and thick platy structure parting to single grain; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 10 percent gravel and 35 percent cobble; slightly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bk1—3 to 18 inches (8 to 46 cm); light brown (7.5YR 6/3) very cobbly sandy loam, brown (7.5YR 5/3), moist; 8 percent clay; single grain; loose, nonsticky and

nonplastic; many very fine and fine and common medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 10 percent gravel and 30 percent cobble; violently effervescent, 9 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk2—18 to 46 inches (46 to 117 cm); light brown (7.5YR 6/4) very gravelly sandy loam, brown (7.5YR 5/4), moist; 8 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 30 percent gravel and 10 percent cobble; violently effervescent, 9 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bk3—46 to 60 inches (117 to 152 cm); brown (7.5YR 5/4) gravelly sandy loam, strong brown (7.5YR 4/6), moist; 9 percent clay; massive; hard, friable, nonsticky and nonplastic; many very fine and fine roots; common very fine tubular pores; many continuous distinct carbonate coats on rock fragments; many medium carbonate masses; 20 percent gravel; strongly effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

### Range in Characteristics

Rock fragments: 20 to 60 percent, averages more than 35 percent

Reaction: 7.9 to 8.4 (moderately alkaline)

Average clay content in the control section: 5 to 15 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: loamy sand, sandy loam

Calcium carbonate equivalent: 1 to 5 percent

#### Bk horizons

Hue: 7.5YR, 10YR

Value: 4 to 7 dry, 3 to 5 moist

Chroma: 3 to 6, dry or moist

Texture: coarse sandy loam, sandy loam

Calcium carbonate equivalent: 5 to 20 percent

### Whitlock, Sonoran soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Typic

Haplocalcids

*Geomorphic position:* side slopes

*Parent material:* mixed calcareous fan alluvium

*Slope:* 5 to 20 percent

#### *Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 40 percent

Woody debris: 5 percent

Bare soil: 15 percent

## Rock fragments:

- gravel: 65 percent
- cobble: 15 percent

*Drainage class:* well drained

*Ksat solum:* 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

*Available water capacity total inches:* 6.5 (moderate)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* medium

*Hydrologic group:* B

*Ecological site name:* Limy Upland 10-13" p.z. Deep

*Ecological site number:* R040XA106AZ

*Present vegetation:* creosotebush, bush muhly, whitethorn acacia, mintbush lippia, mesquite, desert zinnia, perennial forbs

*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 2,200 feet north and 2,400 feet east of the southwest corner of section 10, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 8' 37.70" north, 110° 17' 17.70" west

A—0 to 3 inches (0 to 8 cm); light brown (7.5YR 6/3) gravelly sandy loam, brown (7.5YR 4/3), moist; 9 percent clay; moderate medium and thick platy structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine vesicular and interstitial pores; many continuous distinct carbonate coats on rock fragments; 20 percent gravel and 5 percent cobble; slightly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bk1—3 to 15 inches (8 to 38 cm); light brown (7.5YR 6/3) sandy loam, brown (7.5YR 4/3), moist; 11 percent clay; weak very fine subangular blocky structure parting to single grain; soft, very friable, slightly sticky and nonplastic; many very fine and fine and common medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments and on faces of peds; many medium carbonate masses; 10 percent gravel; violently effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk2—15 to 35 inches (38 to 89 cm); light brown (7.5YR 6/3) sandy loam, brown (7.5YR 4/3), moist; 9 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments and on faces of peds; many medium carbonate masses; 10 percent gravel; violently effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bk3—35 to 60 inches (89 to 152 cm); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4), moist; 9 percent clay; massive; extremely hard, firm, nonsticky and nonplastic; few very fine and few medium roots; many very fine tubular pores; many continuous distinct carbonate coats on faces of peds; many medium carbonate masses; 5 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

### Range in Characteristics

Rock fragments: 5 to 35 percent

Reaction: 7.9 to 8.4 (moderately alkaline)  
 Average clay content in the control section: 5 to 15 percent  
 Calcium carbonate equivalent: 2 to 15 percent

**A horizon**

Hue: 7.5YR, 10YR  
 Value: 5 or 6 dry, 4 or 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: loam, sandy loam

**Bk horizons**

Hue: 7.5YR, 10YR  
 Value: 5 or 6 dry, 4 or 5 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: loam, sandy loam

**Delnorte, Sonoran soils**

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic, shallow Calcic Petrocalcids

*Geomorphic position:* shoulders

*Parent material:* mixed calcareous fan alluvium

*Slope:* 5 to 20 percent

*Surface cover:*

Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

Chemical crust

Salt: 0 percent

Gypsum: 0 percent

Physical cover

Canopy plant cover: 35 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

- gravel: 65 percent
- cobble: 15 percent
- stone: 5 percent

*Depth to restrictive feature(s):* 5 to 20 inches to petrocalcic

*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:* 0.8 (very low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* very high

*Hydrologic group:* D

*Ecological site name:* Limy Upland 10-13" p.z.

*Ecological site number:* R040XA111AZ

*Present vegetation:* creosotebush, ocotillo, fluffgrass, needle grama

*Land capability (nonirrigated):* 7c

**Typical Profile**

*Location*

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 1,300 feet west

and 550 feet south of the northeast corner of section 10, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 9' 0.50" north, 110° 16' 58.80" west

A—0 to 1 inch (0 to 3 cm); brown (10YR 5/3) very gravelly sandy loam, brown (10YR 4/3), moist; 7 percent clay; weak very fine and fine subangular blocky parting to weak very fine and fine granular structure; soft, loose, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; common patchy prominent carbonate coats on rock fragments; 45 percent gravel and 5 percent cobble; violently effervescent, 17 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bk—1 to 13 inches (3 to 33 cm); light gray (10YR 7/2) very gravelly coarse sandy loam, brown (10YR 5/3), moist; 7 percent clay; weak very fine and fine subangular blocky structure parting to single grain; loose, nonsticky and nonplastic; many very fine and fine and few medium and coarse roots; many very fine interstitial pores; many patchy prominent carbonate coats on rock fragments; many fine carbonate masses; 45 percent gravel and 5 percent cobble; violently effervescent, 17 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; very abrupt wavy boundary.

Bkm—13 to 60 inches (33 to 152 cm); cemented material, petrocalcic; very strongly cemented; cemented by carbonates.

### Range in Characteristics

Rock fragments: 35 to 60 percent

Reaction: 7.9 to 8.4 (moderately alkaline)

Clay content: 5 to 15 percent

Calcium carbonate equivalent: 5 to 20 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 to 5 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam

#### Bk horizons

Hue: 7.5YR, 10YR

Value: 5 to 7 dry, 4 or 5 moist

Chroma: 2 or 3, dry or moist

Texture: coarse sandy loam, sandy loam

#### Bkm horizon

Cemented: calcium carbonate

Hardness: extremely hard and indurated

Thickness: 1 foot to 3 feet

## 79—Stronghold-McAllister-Elgin complex, 5 to 25 percent slopes

### Map Unit Setting

*Landform(s):* fan terraces

*Elevation:* 3,900 to 4,600 feet (1,189 to 1,402 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Stronghold and similar soils: 45 percent

McAllister and similar soils: 25 percent

Elgin and similar soils: 20 percent

Minor components: Caralampi, Baboquivari, Tombstone, Riverwash, Sasabe

### Soil Properties and Qualities

#### Stronghold soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Ustic  
Haplocalcids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed calcareous fan alluvium

*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: 60 percent

Woody debris: 5 percent

Bare soil: 15 percent

Rock fragments:

- gravel: 15 percent

- cobble: 5 percent

*Drainage class:* well 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)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Limy Slopes 12-16" p.z.

*Ecological site number:* R041XC308AZ

*Present vegetation:* mesquite, black grama, fluffgrass, Mormon tea, burroweed, false  
mesquite, wolftail, desert holly, pricklypear, cholla

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Knob Hill; about 900 feet south and 600 feet west of the northeast corner of section 4, Township 17 south, Range 22 east

*Geographic Coordinate System:* 31° 59' 28.20" north, 110° 5' 48.20" west

A1—0 to 1 inch (0 to 3 cm); grayish brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2), moist; 5 percent clay; moderate medium and thick platy parting to

weak fine granular structure; soft, friable, nonsticky and nonplastic; many very fine and fine roots; few very fine tubular and many very fine and fine vesicular pores; slightly effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt smooth boundary.

A2—1 to 4 inches (3 to 10 cm); brown (10YR 4/3) sandy loam, dark brown (10YR 3/3), moist; 10 percent clay; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; many very fine tubular and irregular pores; few patchy distinct carbonate coats on rock fragments; 5 percent gravel; violently effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear wavy boundary.

Bk1—4 to 16 inches (10 to 41 cm); pale brown (10YR 6/3) sandy loam, brown (10YR 5/3), moist; 10 percent clay; moderate very fine, fine, and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; common very fine tubular and many very fine and fine irregular pores; common fine and medium carbonate masses; 10 percent gravel; violently effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bk2—16 to 21 inches (41 to 53 cm); very pale brown (10YR 7/3) sandy loam, pale brown (10YR 6/3), moist; 15 percent clay; strong very fine, fine, and medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; many very fine and fine roots; many very fine tubular and many very fine and fine irregular pores; many fine carbonate masses; many fine carbonate nodules; 10 percent gravel; violently effervescent, 17 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bk3—21 to 60 inches (53 to 152 cm); light yellowish brown (10YR 6/4) coarse sandy loam, yellowish brown (10YR 5/4), moist; 7 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; common very fine tubular and many very fine and fine irregular pores; common continuous faint carbonate coats on rock fragments; many fine carbonate masses; 5 percent gravel; violently effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 5 to 35 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in control section: 7 to 18 percent

#### A horizons

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3, dry or moist

Texture: sandy loam, fine sandy loam, loamy sand

Calcium carbonate equivalent: 1 to 10 percent

#### Bk horizons

Hue: 7.5YR, 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 or 4, dry or moist

Texture: loam, sandy loam, coarse sandy loam

Calcium carbonate equivalent: 5 to 20 percent

### McAllister soils

*Taxonomic classification:* Fine-loamy, mixed, superactive, thermic Ustic Calcicargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed calcareous fan alluvium

*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: 80 percent

Woody debris: 5 percent

Bare soil: 15 percent

Rock fragments: 0 percent

*Drainage class:* well drained

*Ksat solum:* 0.20 to 39.69 inches per hour (1.40 to 280.00 micrometers per second)

*Available water capacity total inches:* 8.1 (high)

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Loamy Upland 12-16" p.z.

*Ecological site number:* R041XC313AZ

*Present vegetation:* mesquite, black grama, Mormon tea, burroweed, pricklypear, cholla

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Knob Hill; about 1,600 feet north and 1,900 feet west of the southeast corner of section 34, Township 16 south, Range 22 east

*Geographic Coordinate System:* 31° 59' 44.40" north, 110° 5' 19.60" west

A—0 to 3 inches (0 to 8 cm); brown (7.5YR 4/3) sandy loam, dark brown (7.5YR 3/3), moist; 8 percent clay; weak thin platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine irregular pores; 2 percent gravel; noneffervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

Bt1—3 to 16 inches (8 to 41 cm); reddish brown (5YR 4/3) sandy clay loam, dark reddish brown (5YR 3/3), moist; 22 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine and fine and few medium roots; many very fine tubular and many very fine and fine irregular pores; many continuous distinct clay films on faces of peds, on rock fragments, and between sand grains; 2 percent gravel; noneffervescent; neutral, pH 6.8; clear smooth boundary.

Bt2—16 to 26 inches (41 to 66 cm); reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4), moist; 25 percent clay; moderate very fine and fine subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; many very fine and fine roots; many very fine and fine tubular and irregular pores; common continuous distinct organic stains on faces of peds; many continuous distinct clay films on rock fragments and between sand grains; 3 percent gravel;

slightly effervescent, 2 percent calcium carbonate equivalent; neutral, pH 7.2; abrupt wavy boundary.

Bk—26 to 48 inches (66 to 122 cm); 30 percent pinkish white (7.5YR 8/2) and 70 percent light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4), moist; 25 percent clay; moderate very fine and fine subangular blocky parting to weak fine granular structure; slightly hard, friable, moderately sticky and moderately plastic; many very fine and fine roots; many very fine and fine tubular and irregular pores; many continuous distinct carbonate coats on rock fragments; many fine carbonate masses; 2 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

2Bk—48 to 60 inches (122 to 152 cm); brown (7.5YR 5/4) coarse sand, brown (7.5YR 4/4), moist; 4 percent clay; single grain; loose, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; many continuous distinct carbonate coats on rock fragments; 10 percent gravel; violently effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.8.

### Range in Characteristics

Rock fragments: 0 to 25 percent

Average percentage of clay in control section: 18 to 35 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam

Calcium carbonate equivalent: 0 to 5 percent

Reaction: 6.6 to 7.8 (neutral to slightly alkaline)

#### Bt horizons

Hue: 7.5YR, 5YR

Value: 3 to 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

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

Calcium carbonate equivalent: 0 to 5 percent

Reaction: 6.6 to 7.8 (neutral to slightly alkaline)

#### Bk horizons

Hue: 7.5YR, 5YR

Value: 5 to 8 dry, 4 or 5 moist

Chroma: 2 to 4, dry or moist

Texture: sandy loam, sandy clay loam, coarse sand

Calcium carbonate equivalent: 2 to 20 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

### Elgin soils

*Taxonomic classification:* Fine, mixed, superactive, thermic Calcic Paleargids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*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: 60 percent

Woody debris: 5 percent

Bare soil: 15 percent

Rock fragments:

• gravel: 10 percent

• cobble: 10 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:* 9.0 (high)*Shrink-swell potential:* about 7.5 LEP (high)*Flooding hazard:* none*Runoff class:* high*Hydrologic group:* C*Ecological site name:* Clay Loam Upland 12-16" p.z.*Ecological site number:* R041XC305AZ*Present vegetation:* tobosa, Mormon tea, curly mesquite, sprucetop grama, false mesquite, condalia, mesquite, pricklypear, cholla, whitethorn accacia, black grama, poverty threeawn*Land capability (nonirrigated):* 6c**Typical Profile***Location**Public Land Survey:* USGS Quadrangle—Knob Hill; about 400 feet south and 800 feet west of the northeast corner of section 4, Township 17 south, Range 22 east*Geographic Coordinate System:* 31° 59' 22.70" north, 110° 5' 51.80" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/4) sandy loam, dark brown (7.5YR 3/3), moist; 10 percent clay; moderate medium and thick platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine tubular pores; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

Bt—2 to 12 inches (5 to 30 cm); dark reddish brown (2.5YR 3/4) clay, dark reddish brown (2.5YR 3/4), moist; 55 percent clay; strong very fine, fine, and medium angular blocky structure; very hard, firm, very sticky and very plastic; many very fine and few fine roots; many very fine tubular pores; many continuous distinct clay films on faces of peds and between sand grains; noneffervescent; neutral, pH 7.2; abrupt smooth boundary.

Btk1—12 to 28 inches (30 to 71 cm); 50 percent yellowish red (5YR 4/6) and 50 percent dark reddish brown (5YR 3/4) sandy clay, yellowish red (5YR 4/6), moist; 45 percent clay; strong fine, medium, and coarse angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; common very fine roots; many very fine and fine tubular and irregular pores; many continuous distinct clay films on faces of peds and between sand grains; common fine carbonate masses; violently effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt wavy boundary.

Btk2—28 to 40 inches (71 to 102 cm); 20 percent pink (5YR 8/3) and 80 percent strong brown (7.5YR 4/6) sandy clay loam, brown (7.5YR 5/4), moist; 30 percent clay; strong fine, medium, and coarse angular blocky structure; very hard, friable, moderately sticky and moderately plastic; few fine and medium roots; many very fine

and fine tubular and irregular pores; many continuous distinct clay films on faces of peds and between sand grains; many fine carbonate masses; violently effervescent, 17 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Btk3—40 to 60 inches (102 to 152 cm); 30 percent pinkish white (7.5YR 8/2) and 70 percent strong brown (7.5YR 5/6) sandy clay loam, brown (7.5YR 5/4), moist; 27 percent clay; massive; hard, friable, moderately sticky and slightly plastic; many very fine roots; many very fine and fine tubular and irregular pores; common continuous distinct clay films between sand grains; many continuous distinct carbonate coats on rock fragments; common fine carbonate masses; 5 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

### Range in Characteristics

Rock fragments: 0 to 35 percent

Average percentage of clay in the control section: 35 to 60 percent

#### A horizon

Hue: 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, fine sandy loam,

Reaction: 6.6 to 7.3 (neutral)

#### Bt horizon

Hue: 2.5YR, 5YR

Value: 3 to 5 dry, 3 or 4 moist

Chroma: 3 to 6, dry or moist

Texture: sandy clay, clay

Reaction: 6.6 to 7.8 (neutral to slightly alkaline)

#### Btk horizons

Hue: 5YR, 7.5YR

Value: 3 to 8 dry, 3 to 5 moist

Chroma: 2 to 6, dry or moist

Texture: sandy clay loam, sandy clay

Calcium carbonate equivalent: 2 to 20 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

## 80—Surge-Rock outcrop complex, 5 to 60 percent slopes

### Map Unit Setting

*Landform(s):* hills and mountains

*Elevation:* 3,900 to 4,600 feet (1,189 to 1,402 meters)

*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period:* 180 to 230 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Surge and similar soils: 55 percent

Rock outcrop: 25 percent

Minor components: soils that contain greater than 35 percent clay and greater than 35 percent rock fragments.

### Soil Properties and Qualities

#### Surge soils

*Taxonomic classification:* Loamy, mixed, superactive, calcareous, thermic Lithic Ustic Torriorthents

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* slope alluvium derived from calcareous andesite

*Slope:* 5 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: 60 percent

Woody debris: 5 percent

Bare soil: 10 percent

Rock fragments:

- gravel: 20 percent

- cobble: 5 percent

*Depth to restrictive feature(s):* 10 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 0.01 inches per hour (0.00 to 0.07 micrometers per second)

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

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* D

*Ecological site name:* Volcanic Hills 12-16" p.z. Loamy

*Ecological site number:* R041XC323AZ

*Present vegetation:* sideoats grama, annual grasses, purple grama, bush muhly, mesquite, whitethorn acacia, curly mesquite, oneseed juniper, banana yucca, green sprangletop, perennial forbs, ocotillo, shin dagger

*Land capability (nonirrigated):* 6c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Soza Mesa; about 1,000 feet west and 500 feet south of the northeast corner of section 27, Township 12 south, Range 20 east

*Geographic Coordinate System:* 32° 22' 2.30" north, 110° 17' 21.20" west

A—0 to 1 inch (0 to 3 cm); gray (7.5YR 5/1) gravelly sandy loam, very dark gray (7.5YR 3/1), moist; 13 percent clay; weak thin platy parting to moderate very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine irregular pores; 20 percent gravel; violently effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bw—1 to 15 inches (3 to 38 cm); gray (7.5YR 5/1) sandy clay loam, very dark gray (7.5YR 3/1), moist; 27 percent clay; strong very fine and fine subangular blocky structure; hard, very firm, very sticky and very plastic; many very fine roots; many very fine tubular pores; carbonate, finely disseminated; 10 percent gravel; violently effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt wavy boundary.

R—15 to 60 inches (38 to 152 cm); unweathered andesite bedrock.

### Range in Characteristics

Rock fragments: 0 to 20 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average percentage of clay in the control section: 15 to 30 percent

Calcium carbonate equivalent: 0 to 10 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Texture: sandy loam, loam

#### Bw horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 2 to 4 moist

Chroma: 1 to 4, dry or moist

Texture: sandy clay loam, sandy loam

#### Rock outcrop

Rock outcrop consists of barren rock that occurs as ledges, massive boulder piles, and nearly vertical cliffs of andesite. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the summit of hills and mountains.

## 81—Tenneco loam, 0 to 5 percent slopes

### Map Unit Setting

*Landform(s)*: alluvial fans

*Elevation*: 3,900 to 4,600 feet (1,189 to 1,402 meters)

*Mean annual precipitation*: 12 to 16 inches (305 to 406 millimeters)

*Mean annual air temperature*: 60 to 67 degrees F (15.5 to 19.4 degrees C)

*Mean annual soil temperature*: 62 to 69 degrees F (16.6 to 20.5 degrees C)

*Frost-free period*: 180 to 230 days

*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range

*Land Resource Unit*: 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Tenneco and similar soils: 70 percent

Minor components: Guest, Durazo, soils with less than 18 percent clay

### Soil Properties and Qualities

#### Tenneco soils

*Taxonomic classification*: Fine-loamy, mixed, superactive, thermic Ustic Haplocambids

*Geomorphic position*: inset between terraces and pediments

*Parent material:* mixed calcareous fan alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

  Cyanobacteria: 0 percent

  Lichen: 0 percent

  Moss: 0 percent

Chemical crust

  Salt: 0 percent

  Gypsum: 0 percent

Physical cover

  Canopy plant cover: 40 percent

  Woody debris: 35 percent

  Bare soil: 20 percent

  Rock fragments:

- gravel: 5 percent

*Drainage class:* well drained

*Ksat solum:* 0.20 to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

*Available water capacity total inches:* 10.5 (very high)

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* rare

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Loamy Swale 12-16" p.z.

*Ecological site number:* R041XC311AZ

*Present vegetation:* tobosa, mesquite, banana yucca, broom snakeweed, burrograss, perennial forbs, burroweed, pricklypear, and cholla

*Land capability (nonirrigated):* 6c

### Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—Deepwell Ranch; about 2,550 feet east and 2,900 feet north of the southwest corner of section 31, Township 14 south, Range 22 east

*Geographic Coordinate System:* 32° 10' 28.00" north, 110° 8' 25.00" west

A—0 to 3 inches (0 to 8 cm); brown (7.5YR 5/4) loam, dark brown (7.5YR 3/4), moist; 25 percent clay; moderate medium and coarse platy parting to weak thin platy structure; soft, very friable, moderately sticky and moderately plastic; common very fine and fine roots; many very fine tubular pores; strongly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bw1—3 to 10 inches (8 to 25 cm); brown (7.5YR 5/4) loam, dark brown (7.5YR 3/4), moist; 26 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; common very fine and fine roots; many very fine tubular pores; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bw2—10 to 26 inches (25 to 66 cm); brown (7.5YR 4/4) clay loam, dark brown (7.5YR 3/4), moist; 34 percent clay; moderate very fine and fine subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine roots; many very fine tubular pores; few fine carbonate filaments on faces of peds; violently effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk1—26 to 43 inches (66 to 109 cm); brown (7.5YR 5/3) clay loam, brown (7.5YR

4/3), moist; 32 percent clay; moderate very fine and fine subangular blocky structure; slightly hard, friable, moderately sticky and very plastic; few very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; common fine carbonate masses; 5 percent gravel; violently effervescent, 14 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bk2—43 to 60 inches (109 to 152 cm); brown (7.5YR 4/3) clay loam, dark brown (7.5YR 3/3), moist; 38 percent clay; moderate very fine and fine subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few very fine roots; many very fine tubular pores; many continuous distinct carbonate coats on rock fragments; many fine and medium carbonate filaments; 5 percent gravel; violently effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 8.2.

### Range in Characteristics

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in control section: 18 to 35 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

#### Bw horizons

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: loam, clay loam, sandy clay loam

Calcium carbonate equivalent: 0 to 10 percent

#### Bk horizons

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: loam, clay loam, sandy clay loam

Calcium carbonate equivalent: 5 to 15 percent

## 82—Terrarossa-Blacktail complex, 5 to 25 percent slopes

### Map Unit Setting

*Landform(s):* fan terraces

*Elevation:* 4,400 to 5,600 feet (1,341 to 1,707 meters)

*Mean annual precipitation:* 16 to 20 inches (406 to 508 millimeters)

*Mean annual air temperature:* 57 to 62 degrees F (13.9 to 16.7 degrees C)

*Mean annual soil temperature:* 59 to 64 degrees F (15.0 to 17.8 degrees C)

*Frost-free period:* 160 to 210 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-1; Mexican Oak-Pinyon Woodland and Oak Savannah

### Map Unit Composition

Terrarossa and similar soils: 55 percent

Blacktail and similar soils: 30 percent

Minor components: Murray, Ashcreek, soils containing greater than 35 percent rock fragments

## Soil Properties and Qualities

### Terrarossa soils

*Taxonomic classification:* Fine, mixed, superactive, thermic Aridic Paleustalfs

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*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: 50 percent

Woody debris: 0 percent

Bare soil: 30 percent

Rock fragments:

- gravel: 45 percent

- cobble: 15 percent

*Depth to restrictive feature(s):* 2 to 6 inches to abrupt textural change

*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:* 0.2 (very low)

*Shrink-swell potential:* about 7.5 LEP (high)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* C

*Ecological site name:* Loamy Upland 16-20" p.z.

*Ecological site number:* R041XA108AZ

*Present vegetation:* annual grasses, blue grama, mesquite, perennial forbs, plains lovegrass, sideoats grama, black grama, spidergrass, curly mesquite, shrubby buckwheat, tobosa

*Land capability (nonirrigated):* 6c

## Typical Profile

### Location

*Public Land Survey:* USGS Quadrangle—Hookers Hot Springs; about 1,900 feet north and 900 feet west of the southeast corner of section 19, Township 13 south, Range 22 east

*Geographic Coordinate System:* 32° 17' 11.90" north, 110° 8' 5.10" west

A—0 to 2 inches (0 to 5 cm); yellowish red (5YR 4/6) gravelly sandy clay loam, dark reddish brown (5YR 3/4), moist; 24 percent clay; weak thin platy parting to weak very fine subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; many very fine and fine roots; many fine irregular and common fine vesicular pores; 20 percent gravel; noneffervescent; slightly acid, pH 6.4; abrupt smooth boundary.

Bt1—2 to 6 inches (5 to 15 cm); dark reddish brown (5YR 3/4) clay, dark reddish brown (5YR 3/4), moist; 56 percent clay; strong very fine and fine subangular blocky structure; hard, friable, very sticky and very plastic; many very fine and fine roots;

many very fine tubular pores; many continuous distinct clay films on faces of peds and on rock fragments; 10 percent gravel; noneffervescent; neutral, pH 6.6; abrupt smooth boundary.

Bt<sub>2</sub>—6 to 21 inches (15 to 53 cm); dark reddish brown (2.5YR 3/4) clay, dark reddish brown (2.5YR 3/4), moist; 65 percent clay; strong fine, medium, and coarse subangular blocky structure; extremely hard, firm, very sticky and very plastic; many very fine roots; many very fine tubular pores; many continuous distinct clay films on faces of peds and on rock fragments; many continuous distinct pressure faces; 5 percent gravel; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

Btk—21 to 33 inches (53 to 84 cm); reddish brown (2.5YR 4/4) clay, red (2.5YR 4/6), moist; 53 percent clay; strong very fine and fine subangular blocky structure; hard, friable, very sticky and very plastic; few very fine roots; many very fine tubular pores; many continuous distinct clay films on faces of peds and on rock fragments; common continuous distinct carbonate coats on faces of peds and on rock fragments; 5 percent gravel; violently effervescent, 3 percent calcium carbonate equivalent; neutral, pH 7.2; abrupt wavy boundary.

2Btk—33 to 60 inches (84 to 152 cm); reddish brown (2.5YR 4/4) extremely gravelly clay, red (2.5YR 4/6), moist; 48 percent clay; moderate very fine and fine subangular blocky structure; slightly hard, very friable, very sticky and very plastic; few very fine roots; common very fine tubular pores; many continuous distinct clay films on faces of peds and on rock fragments; common continuous distinct carbonate coats on faces of peds and on rock fragments; 55 percent gravel and 15 percent cobble; violently effervescent, 3 percent calcium carbonate equivalent; slightly alkaline, pH 7.8.

### Range in Characteristics

Organic matter: 0.5 to 1 percent

Average percentage of clay in control section: 35 to 65 percent

#### A horizon

Hue: 7.5YR, 5YR

Value: 3 or 4 dry or moist

Chroma: 3 to 6 dry, 3 or 4 moist

Texture: loam, clay loam, sandy clay loam

Reaction: 6.1 to 7.3 (slightly acid to neutral)

Rock fragments: 5 to 25 percent

#### Bt and Btk horizons

Hue: 2.5YR, 5YR

Value: 3 to 5 dry, 3 or 4 moist

Chroma: 3 to 6, dry or moist

Texture: clay, clay loam

Reaction: 6.1 to 7.8 (slightly acid to slightly alkaline)

Rock fragments: 5 to 25 percent

Calcium carbonate equivalent: 0 to 5 percent

#### 2Btk horizon

Hue: 2.5YR, 5YR

Value: 3 to 5 dry, 3 or 4 moist

Chroma: 3 to 6, dry or moist

Texture: clay, clay loam

Reaction: 6.1 to 7.8 (slightly acid to slightly alkaline)

Rock fragments: 50 to 70 percent

Calcium carbonate equivalent: 1 to 5 percent

**Blacktail soils**

*Taxonomic classification:* Fine, mixed, superactive, thermic Calcic Argiustolls

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed fan alluvium

*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: 45 percent

Woody debris: 0 percent

Bare soil: 30 percent

Rock fragments:

- gravel: 45 percent

- cobble: 15 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:* 8.1 (high)

*Shrink-swell potential:* about 7.5 LEP (high)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* C

*Ecological site name:* Clay Loam Upland 16-20" p.z.

*Ecological site number:* R041XA109AZ

*Present vegetation:* tobosa, blue grama, sideoats grama, annual grasses, perennial forbs, Palmer agave, mesquite, shrubby buckwheat

*Land capability (nonirrigated):* 6c

**Typical Profile***Location*

*Public Land Survey:* USGS Quadrangle—Muskhog Mountain; about 1,300 feet south and 2,600 feet west of the northeast corner of section 29, Township 13 south, Range 22 east

*Geographic Coordinate System:* 32° 16' 42.80" north, 110° 7' 26.40" west

A—0 to 2 inches (0 to 5 cm); reddish brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/3), moist; 30 percent clay; weak very fine platy parting to weak very fine granular structure; soft, very friable, very sticky and very plastic; many very fine roots; many very fine irregular pores; 5 percent gravel; noneffervescent; neutral, pH 6.8; abrupt smooth boundary.

Bt1—2 to 7 inches (5 to 18 cm); dark reddish brown (5YR 3/3) clay, dark reddish brown (5YR 3/3), moist; 56 percent clay; strong very fine and fine subangular blocky structure; slightly hard, friable, very sticky and very plastic; many very fine roots; many very fine tubular pores; many continuous distinct clay films on faces of peds and on rock fragments; 5 percent gravel; noneffervescent; neutral, pH 6.8; clear smooth boundary.

Bt2—7 to 24 inches (18 to 61 cm); dark reddish brown (5YR 3/3) clay, dark reddish brown (5YR 3/3), moist; 60 percent clay; strong fine, medium, and coarse angular

blocky structure; extremely hard, firm, very sticky and very plastic; common very fine roots; common very fine tubular pores; many continuous distinct clay films on faces of peds and on rock fragments; 5 percent gravel; noneffervescent; neutral, pH 7.2; abrupt wavy boundary.

Btk1—24 to 33 inches (61 to 84 cm); yellowish red (5YR 5/6) very gravelly clay, yellowish red (5YR 5/6), moist; 46 percent clay; moderate very fine subangular blocky structure; slightly hard, friable, very sticky and very plastic; few very fine roots; common very fine tubular pores; many continuous distinct clay films on faces of peds and on rock fragments; many continuous distinct carbonate coats on faces of peds and on rock fragments; 25 percent gravel and 10 percent cobble; violently effervescent, 21 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Btk2—33 to 60 inches (84 to 152 cm); yellowish red (5YR 4/6) clay, yellowish red (5YR 4/6), moist; 43 percent clay; moderate very fine subangular blocky structure; slightly hard, friable, very sticky and very plastic; few very fine roots; common very fine tubular pores; many continuous distinct clay films on faces of peds and on rock fragments; many continuous distinct carbonate coats on faces of peds and on rock fragments; 10 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.0.

#### Range in Characteristics

Rock fragments: 5 to 35 percent

Organic matter: 1 to 2 percent

Average percentage of clay in the control section: 35 to 60 percent

#### A horizon

Hue: 5YR, 7.5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 2 to 4, dry or moist

Texture: clay, clay loam

Reaction: 6.1 to 7.3 (slightly acid to neutral)

#### Bt horizons

Hue: 2.5YR, 5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 2 to 6 dry, 2 to 4 moist

Texture: clay, clay loam

Reaction: 6.1 to 7.3 (slightly acid to neutral)

#### Btk horizons

Hue: 5YR, 2.5YR

Value: 4 to 8, dry or moist

Chroma: 3 to 6, dry or moist

Texture: sandy clay loam, clay

Reaction: 7.4 to 8.4 (slightly alkaline to moderately alkaline)

Calcium carbonate equivalent: 15 to 30 percent

## 83—Tombstone-Stronghold complex, 5 to 30 percent slopes

#### Map Unit Setting

*Landform(s)*: fan terraces

*Elevation:* 3,900 to 4,600 feet (1,189 to 1,402 meters)  
*Mean annual precipitation:* 12 to 16 inches (305 to 406 millimeters)  
*Mean annual air temperature:* 60 to 67 degrees F (15.5 to 19.4 degrees C)  
*Mean annual soil temperature:* 62 to 69 degrees F (16.6 to 20.5 degrees C)  
*Frost-free period:* 180 to 230 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-3; Southern Arizona Semidesert Grassland

### Map Unit Composition

Tombstone and similar soils: 65 percent  
 Stronghold and similar soils: 25 percent  
 Minor components: Eloma, Caralampi, McNeal, Nolam

### Soil Properties and Qualities

#### Tombstone soils

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Ustic Haplocalcids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed calcareous fan alluvium

*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: 40 percent

  Woody debris: 5 percent

  Bare soil: 40 percent

  Rock fragments:

    • gravel: 50 percent

    • cobble: 10 percent

*Drainage class:* somewhat excessively drained

*Ksat solum:* 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

*Available water capacity total inches:* 3.5 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Limy Upland 12-16" p.z. Deep

*Ecological site number:* R041XC331AZ

*Present vegetation:* whitethorn acacia, creosotebush, bush muhly, sideoats grama, mariola, black grama, broom snakeweed, desert zinnia, mintbush lippia, white stem paperflower

*Land capability (nonirrigated):* 6c

### Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—San Pedro Ranch; about 600 feet east and 2,200 feet south of the northwest corner of section 8, Township 16 south, Range 21 east

*Geographic Coordinate System:* 32° 3' 35.00" north, 110° 13' 42.00" west

A—0 to 3 inches (0 to 8 cm); brown (7.5YR 5/2) very gravelly sandy loam, very dark brown (7.5YR 2.5/2), moist; 8 percent clay; weak medium platy parting to weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; common continuous distinct carbonate coats on rock fragments; 50 percent gravel; violently effervescent, 3 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Bk1—3 to 16 inches (8 to 41 cm); brown (7.5YR 5/3) very gravelly loam, dark brown (7.5YR 3/3), moist; 12 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky and moderately plastic; many very fine and fine roots and few medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; 45 percent gravel and 5 percent cobble; violently effervescent, 19 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bk2—16 to 40 inches (41 to 102 cm); very pale brown (10YR 7/3) very gravelly sandy loam, pale brown (10YR 6/3), moist; 8 percent clay; massive; loose, slightly sticky and moderately plastic; many very fine and fine and few medium roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; common fine and medium carbonate masses; 50 percent gravel and 5 percent cobble; violently effervescent, 33 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Bk3—40 to 60 inches (102 to 152 cm); very pale brown (10YR 7/3) very gravelly sandy loam, yellowish brown (10YR 5/4), moist; 10 percent clay; massive; loose, slightly sticky and moderately plastic; many very fine and fine roots; many very fine interstitial pores; many continuous distinct carbonate coats on rock fragments; many medium and coarse carbonate nodules; 50 percent gravel and 5 percent cobble; violently effervescent, 28 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

### Range in Characteristics

Rock fragments: 35 to 60 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 5 to 18 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 2 to 4, dry or moist

Texture: sandy loam

Calcium carbonate equivalent: 1 to 10 percent

#### Bk horizons

Hue: 7.5YR, 10YR

Value: 4 to 7 dry, 3 to 6 moist

Chroma: 2 to 4, dry or moist

Texture: loam, sandy loam

Calcium carbonate equivalent: 15 to 40 percent

### Stronghold soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Ustic

Haplocalcids

*Geomorphic position:* generally on shoulders and side slopes

*Parent material:* mixed calcareous fan alluvium

*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: 40 percent

  Woody debris: 5 percent

  Bare soil: 40 percent

  Rock fragments:

    • gravel: 45 percent

    • cobble: 5 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:* 5.4 (moderate)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* high

*Hydrologic group:* B

*Ecological site name:* Limy Upland 12-16" p.z. Deep

*Ecological site number:* R041XC331AZ

*Present vegetation:* whitethorn acacia, creosotebush, mariola, bush muhly, desert zinnia, fluffgrass, snakeweed, tarbush

*Land capability (nonirrigated):* 6c

### Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—San Pedro Ranch; about 650 feet east and 2,100 feet south of the northwest corner of section 8, Township 16 south, Range 21 east

*Geographic Coordinate System:* 32° 3' 35.00" north, 110° 13' 42.00" west

A—0 to 2 inches (0 to 5 cm); pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 5/3), moist; 10 percent clay; weak thin platy parting to weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; common continuous distinct carbonate coats on rock fragments; 20 percent gravel; violently effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bk—2 to 60 inches (5 to 152 cm); brown (7.5YR 5/4) gravelly sandy loam, dark brown (7.5YR 3/3), moist; 10 percent clay; weak very fine, fine, and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium and coarse roots; many very fine interstitial and few very coarse tubular pores; common continuous distinct carbonate coats on rock fragments; 25 percent gravel; violently effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

### Range in Characteristics

Rock fragments: 10 to 35 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 5 to 20 percent

Calcium carbonate equivalent: 7 to 15 percent

A horizon

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

Texture: sandy loam

Bk horizon

Hue: 7.5YR, 10YR

Value: 5 to 7 dry, 3 to 6 moist

Chroma: 2 to 4, dry or moist

Texture: loam, sandy loam

## **84—Vinton-Gila complex, Chihuahuan, 0 to 3 percent slopes**

### **Map Unit Setting**

*Landform(s):* flood plains

*Elevation:* 2,900 to 3,600 feet (884 to 1,098 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-2; AZ Chihuahuan-Sonoran Desert Shrub Mix

### **Map Unit Composition**

Vinton, Chihuahuan, and similar soils: 45 percent

Gila, Chihuahuan, and similar soils: 40 percent

Minor components: Hantz, Brazito

### **Soil Properties and Qualities**

#### **Vinton, Chihuahuan soils**

*Taxonomic classification:* Sandy, mixed, thermic Typic Torrfluents

*Geomorphic position:* dissected by erosional channels

*Parent material:* mixed stream alluvium

*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: 90 percent

Woody debris: 5 percent

Bare soil: 5 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:* 5.7 (moderate)  
*Shrink-swell potential:* about 1.5 LEP (low)  
*Flooding hazard:* occasional  
*Runoff class:* very low  
*Hydrologic group:* A  
*Ecological site name:* Prosopis glandulosa var. torreyana-Prosopis velutina/  
     Sporobolus wrightii  
*Ecological site number:* F041XB221AZ  
*Present vegetation:* mesquite, bush muhly, catclaw acacia, graythorn, plains  
     bristlegrass, spike dropseed, annual grasses, Engelmann's prickly pear, staghorn  
     cholla  
*Land capability (irrigated):* 3w  
*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 2,200 feet south and 150 feet west of the northeast corner of section 4, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 9' 31.00" north, 110° 17' 45.00" west

Ap1—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) fine sandy loam, brown (7.5YR 4/3), moist; 10 percent clay; moderate thin platy structure parting to single grain; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; common very fine vesicular and tubular pores; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Ap2—2 to 15 inches (5 to 38 cm); brown (7.5YR 5/3) fine sandy loam, brown (7.5YR 4/3), moist; 10 percent clay; moderate fine and medium cloddy structure; slightly hard, friable, nonsticky and nonplastic; many very fine and common fine and medium roots; common very fine tubular pores; violently effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

C1—15 to 37 inches (38 to 94 cm); light brown (7.5YR 6/3) fine sand, brown (7.5YR 4/3), moist; 3 percent clay; massive; soft, friable, nonsticky and nonplastic; many very fine and few fine roots; many very fine interstitial pores; few iron-manganese masses; 2 percent gravel; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—37 to 54 inches (94 to 137 cm); brown (7.5YR 5/3) loamy fine sand, brown (7.5YR 4/3), moist; 3 percent clay; weak medium and coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine tubular pores; few iron-manganese masses; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C3—54 to 60 inches (137 to 152 cm); brown (7.5YR 5/3) loamy fine sand, brown (7.5YR 4/3), moist; 3 percent clay; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; few iron-manganese masses; slightly effervescent; moderately alkaline, pH 8.2.

### Range in Characteristics

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 3 to 7 percent

**A horizons**

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

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

**C horizons**

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: fine sand, loamy fine sand, fine sandy loam; contains strata of finer or coarser material

**Gila, Chihuahuan soils***Taxonomic classification:* Coarse-loamy, mixed, superactive, calcareous, thermic  
Typic Torrfluvents*Geomorphic position:* dissected by erosional channels*Parent material:* mixed stream alluvium*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: 90 percent

Woody debris: 5 percent

Bare soil: 5 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:* 8.3 (high)*Shrink-swell potential:* about 1.5 LEP (low)*Flooding hazard:* occasional*Runoff class:* low*Hydrologic group:* B*Ecological site name:* Prosopis glandulosa var. torreyana-Prosopis velutina/  
Sporobolus wrightii*Ecological site number:* F041XB221AZ*Present vegetation:* mesquite, bush muhly, catclaw acacia, graythorn, plains  
bristlegrass, spike dropseed, annual grasses, Engelmann's prickly pear, staghorn  
cholla*Land capability (irrigated):* 3w*Land capability (nonirrigated):* 7c**Typical Profile***Location**Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 2,150 feet south  
and 150 feet west of the northeast corner of section 4, Township 15 south, Range 20  
east

*Geographic Coordinate System:* 32° 9' 30.00" north, 110° 17' 45.00" west

Ap1—0 to 3 inches (0 to 8 cm); brown (7.5YR 5/3) fine sandy loam, brown (7.5YR 4/3), moist; 11 percent clay; weak medium and coarse platy structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots; many very fine tubular and irregular pores; strongly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

Ap2—3 to 17 inches (8 to 43 cm); brown (7.5YR 5/3) loam, brown (7.5YR 4/3), moist; 11 percent clay; weak very fine and fine cloddy structure; slightly hard, firm, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C—17 to 22 inches (43 to 56 cm); brown (7.5YR 5/3) very fine sandy loam, brown (7.5YR 4/3), moist; 11 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Cknyz—22 to 46 inches (56 to 117 cm); brown (7.5YR 5/3) very fine sandy loam, brown (7.5YR 4/3), moist; 12 percent clay; massive; slightly hard, firm, nonsticky and nonplastic; many very fine and common fine roots; many very fine and fine interstitial pores; common thin continuous distinct carbonate seams; common distinct iron depletions and distinct masses of oxidized iron; many fine carbonate and gypsum masses; violently effervescent; very strongly alkaline, pH 9.2; abrupt smooth boundary.

2C—46 to 60 inches (117 to 152 cm); light brown (7.5YR 6/4) sand, brown (7.5YR 5/4), moist; 4 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and common fine roots; many very fine interstitial and common fine interstitial pores; violently effervescent; moderately alkaline, pH 8.2.

### Range in Characteristics

Reaction: 7.4 to 9.2 (slightly to very strongly alkaline)

Average clay content in control section: 7 to 15 percent

#### A horizons

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 to 4, dry or moist

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

#### C horizons

Hue: 7.5YR, 10YR

Value: 3 to 6 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

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

## 85—Vinton-Gila complex, Sonoran, 0 to 3 percent slopes

### Map Unit Setting

*Landform(s):* flood plains

*Elevation:* 2,900 to 3,600 feet (884 to 1,098 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 40; Sonoran Basin and Range

*Land Resource Unit:* 40-1; Upper Sonoran Desert Shrub

### Map Unit Composition

Vinton, Sonoran and similar soils: 45 percent

Gila, Sonoran, and similar soils: 40 percent

Minor components: Hantz, Brazito

### Soil Properties and Qualities

#### Vinton, Sonoran soils

*Taxonomic classification:* Sandy, mixed, thermic Typic Torrifuvents

*Geomorphic position:* dissected by erosional channels

*Parent material:* mixed stream alluvium

*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: 90 percent

Woody debris: 5 percent

Bare soil: 5 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:* 5.7 (moderate)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* occasional

*Runoff class:* very low

*Hydrologic group:* A

*Ecological site name:* Prosopis velutina/Sporobolus wrightii

*Ecological site number:* F040XA124AZ

*Present vegetation:* mesquite, bush muhly, catclaw acacia, graythorn, plains  
bristlegrass, spike dropseed, annual grasses, Engelmann's prickly pear, staghorn  
cholla

*Land capability (irrigated):* 3w

*Land capability (nonirrigated):* 7c

### Typical Profile

*Location*

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 2,200 feet south and 150 feet west of the northeast corner of section 4, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 9' 31.00" north, 110° 17' 45.00" west

Ap1—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) fine sandy loam, brown (7.5YR 4/3), moist; 10 percent clay; moderate thin platy structure parting to single grain; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; common very

fine vesicular and tubular pores; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Ap2—2 to 15 inches (5 to 38 cm); brown (7.5YR 5/3) fine sandy loam, brown (7.5YR 4/3), moist; 10 percent clay; moderate fine and medium cloddy structure; slightly hard, friable, nonsticky and nonplastic; many very fine and common fine and medium roots; common very fine tubular pores; violently effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

C1—15 to 37 inches (38 to 94 cm); light brown (7.5YR 6/3) fine sand, brown (7.5YR 4/3), moist; 3 percent clay; massive; soft, friable, nonsticky and nonplastic; many very fine and few fine roots; many very fine interstitial pores; few iron-manganese masses; 2 percent gravel; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—37 to 54 inches (94 to 137 cm); brown (7.5YR 5/3) loamy fine sand, brown (7.5YR 4/3), moist; 3 percent clay; weak medium and coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine tubular pores; few iron-manganese masses; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C3—54 to 60 inches (137 to 152 cm); brown (7.5YR 5/3) loamy fine sand, brown (7.5YR 4/3), moist; 3 percent clay; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; few iron-manganese masses; slightly effervescent; moderately alkaline, pH 8.2.

#### Range in Characteristics

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 3 to 7 percent

#### A horizons

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

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

#### C horizons

Hue: 7.5YR, 10YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: fine sand, loamy fine sand, fine sandy loam: contains strata of finer or coarser material

#### Gila, Sonoran soils

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

*Geomorphic position:* dissected by erosional channels

*Parent material:* mixed stream alluvium

*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: 90 percent

Woody debris: 5 percent

Bare soil: 5 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:* 8.3 (high)*Shrink-swell potential:* about 1.5 LEP (low)*Flooding hazard:* occasional*Runoff class:* low*Hydrologic group:* B*Ecological site name:* Prosopis velutina/Sporobolus wrightii*Ecological site number:* F040XA124AZ*Present vegetation:* mesquite, bush muhly, catclaw acacia, graythorn, plains  
bristlegrass, spike dropseed, annual grasses, Engelmann's prickly pear, staghorn  
cholla*Land capability (irrigated):* 3w*Land capability (nonirrigated):* 7c**Typical Profile***Location**Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 2,150 feet south  
and 150 feet west of the northeast corner of section 4, Township 15 south, Range 20  
east*Geographic Coordinate System:* 32° 9' 30.00" north, 110° 17' 45.00" westAp1—0 to 3 inches (0 to 8 cm); brown (7.5YR 5/3) fine sandy loam, brown (7.5YR  
4/3), moist; 11 percent clay; weak medium and coarse platy structure; soft, very  
friable, nonsticky and nonplastic; many very fine and common fine roots; many very  
fine tubular and irregular pores; strongly effervescent; slightly alkaline, pH 7.8; clear  
smooth boundary.Ap2—3 to 17 inches (8 to 43 cm); brown (7.5YR 5/3) loam, brown (7.5YR 4/3), moist;  
11 percent clay; weak very fine and fine cloddy structure; slightly hard, firm, slightly  
sticky and slightly plastic; many very fine and fine roots; many very fine and fine  
tubular pores; violently effervescent; moderately alkaline, pH 8.2; clear smooth  
boundary.C1—17 to 22 inches (43 to 56 cm); brown (7.5YR 5/3) very fine sandy loam, brown  
(7.5YR 4/3), moist; 11 percent clay; massive; soft, very friable, nonsticky and  
nonplastic; many very fine roots; many very fine interstitial pores; violently  
effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.Cknyz—22 to 46 inches (56 to 117 cm); brown (7.5YR 5/3) very fine sandy loam,  
brown (7.5YR 4/3), moist; 12 percent clay; massive; slightly hard, firm, nonsticky and  
nonplastic; many very fine and common fine roots; many very fine and fine interstitial  
pores; common continuous distinct thin carbonate seams; common distinct iron  
depletions and distinct masses of oxidized iron; many fine carbonate and gypsum  
masses; violently effervescent; very strongly alkaline, pH 9.2; abrupt smooth  
boundary.2C—46 to 60 inches (117 to 152 cm); light brown (7.5YR 6/4) sand, brown (7.5YR  
5/4), moist; 4 percent clay; single grain; loose, nonsticky and nonplastic; many very  
fine and common fine roots; many very fine interstitial and common fine interstitial  
pores; violently effervescent; moderately alkaline, pH 8.2.

### Range in Characteristics

Reaction: 7.4 to 9.2 (slightly to very strongly alkaline)  
Average clay content in the control section: 7 to 15 percent

#### A horizons

Hue: 7.5YR, 10YR  
Value: 4 or 5 dry, 3 or 4 moist  
Chroma: 2 to 4, dry or moist  
Texture: very fine sandy loam, silt loam, loam, fine sandy loam

#### C horizons

Hue: 7.5YR, 10YR  
Value: 3 to 6 dry, 3 to 5 moist  
Chroma: 2 to 4, dry or moist  
Texture: very fine sandy loam, silt loam, loam, fine sandy loam, sand

## 86—Wikieup family-Anklam complex, 10 to 45 percent slopes

### Map Unit Setting

*Landform(s)*: mountains  
*Elevation*: 3,400 to 3,800 feet (1,036 to 1,158 meters)  
*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)  
*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)  
*Mean annual soil temperature*: 64 to 70 degrees F (17.8 to 21.1 degrees C)  
*Frost-free period*: 190 to 260 days  
*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range  
*Land Resource Unit*: 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### Map Unit Composition

Wikieup family and similar soils: 45 percent  
Anklam and similar soils: 40 percent  
Minor components: soils containing greater than 35 percent clay and rock fragments, soils with carbonate, Rock outcrops

### Soil Properties and Qualities

#### Wikieup family

*Taxonomic classification*: Loamy-skeletal, mixed, superactive, nonacid, thermic, shallow Typic Torriorthents  
*Geomorphic position*: generally on mountaintops and mountain flanks  
*Parent material*: slope alluvium derived from granite  
*Slope*: 10 to 45 percent  
*Surface cover*:  
Biological crust  
Cyanobacteria: 0 percent  
Lichen: 0 percent  
Moss: 0 percent  
Chemical crust  
Salt: 0 percent  
Gypsum: 0 percent  
Physical cover  
Canopy plant cover: 40 percent

Woody debris: 5 percent

Bare soil: 5 percent

Rock fragments:

- gravel: 15 percent
- cobble: 25 percent
- stone: 45 percent

*Depth to restrictive feature(s):* 10 to 20 inches to bedrock, paralithic; 25 to 60 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 0.06 inches per hour (0.00 to 0.42 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:* C

*Ecological site name:* Granitic Hills 8-12" p.z.

*Ecological site number:* R041XB205AZ

*Present vegetation:* whitethorn acacia, mintbush lippia, annual grasses, bush muhly, perennial forbs, mesquite, catclaw acacia, slender janusia

*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Galleta Flat East; about 1,100 feet west and 1,300 feet south of the northeast corner of section 20, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 7' 13.60" north, 110° 18' 59.30" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/3) very gravelly sandy loam, brown (7.5YR 4/3), moist; 8 percent clay; weak medium and coarse platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 40 percent gravel; noneffervescent; moderately acid, pH 6.0; clear smooth boundary.

C—2 to 13 inches (5 to 33 cm); brown (7.5YR 5/3) very gravelly sandy loam, brown (7.5YR 4/3), moist; 8 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 40 percent gravel and 15 percent cobble; noneffervescent; slightly acid, pH 6.4; abrupt wavy boundary.

Cr—13 to 25 inches (33 to 64 cm); weathered granite bedrock.

R—25 to 60 inches (64 to 152 cm); unweathered granite bedrock.

### Range in Characteristics

Rock fragments: 35 to 60 percent

Reaction: 5.6 to 6.5 (moderately to slightly acid)

Average clay content in the control section: 7 to 15 percent

#### A horizon

Hue: 7.5YR, 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam

**C horizon**

Hue: 7.5YR, 10YR  
 Value: 4 or 5 dry, 3 or 4 moist  
 Chroma: 3 or 4, dry or moist  
 Texture: sandy loam

Wikieup series is moist in some part of the soil moisture control section for less than 20 days cumulative between July and September.

**Anklam soils**

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic, shallow Typic Haplargids

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* slope alluvium derived from granite

*Slope:* 10 to 45 percent

*Surface cover:*

## Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

## Chemical crust

Salt: 0 percent

Gypsum: 0 percent

## Physical cover

Canopy plant cover: 40 percent

Woody debris: 5 percent

Bare soil: 15 percent

Rock fragments:

- gravel: 25 percent

- cobble: 35 percent

*Depth to restrictive feature(s):* 10 to 20 inches to bedrock, paralithic; 20 to 30 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 0.06 inches per hour (0.00 to 0.42 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:* very high

*Hydrologic group:* C

*Ecological site name:* Granitic Hills 8-12" p.z.

*Ecological site number:* R041XB205AZ

*Present vegetation:* whitethorn acacia, annual grasses, bush muhly, mintbush lippia, perennial forbs, paloverde, sideoats grama, slender grama, spidergrass

*Land capability (nonirrigated):* 7c

**Typical Profile***Location*

*Public Land Survey:* USGS Quadrangle—Wildhorse Mountain; about 2,250 feet west and 4,000 feet south of the northeast corner of section 16, Township 15 south, Range 20 east

*Geographic Coordinate System:* 32° 7' 40.00" north, 110° 18' 35.50" west

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 4/4) very gravelly sandy loam, dark brown (7.5YR 3/3), moist; 11 percent clay; weak medium and coarse platy parting to weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 30 percent gravel and 10 percent cobble; noneffervescent; neutral, pH 7.0; abrupt smooth boundary.

Bt—2 to 13 inches (5 to 33 cm); reddish brown (5YR 4/3) very gravelly sandy clay loam, dark reddish brown (5YR 3/3), moist; 21 percent clay; moderate very fine and fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; common continuous distinct organic stains on rock fragments; many continuous distinct clay films on rock fragments and on faces of peds; 30 percent gravel and 15 percent cobble; noneffervescent; neutral, pH 6.8; abrupt wavy boundary.

Crt—13 to 20 inches (33 to 46 cm); many very fine roots in fractures; common continuous distinct organic stains and many continuous distinct clay films in fractures; weathered granite bedrock.

R—20 to 60 inches (46 to 152 cm); unweathered granite bedrock.

#### **Range in Characteristics**

Rock fragments: 35 to 60 percent

Reaction: 6.6 to 7.3 (neutral)

Average clay content in the control section: 18 to 35 percent

A horizon

Hue: 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam

Bt horizon

Hue: 2.5YR, 5YR

Value: 3 or 4, dry or moist

Chroma: 3 or 4, dry or moist

Texture: sandy loam, sandy clay loam

## **87—Yana gravelly loamy sand, 0 to 5 percent slopes**

### **Map Unit Setting**

*Landform(s):* stream terraces

*Elevation:* 2,900 to 3,800 feet (884 to 1,158 meters)

*Mean annual precipitation:* 10 to 12 inches (254 to 305 millimeters)

*Mean annual air temperature:* 62 to 68 degrees F (16.7 to 20.0 degrees C)

*Mean annual soil temperature:* 64 to 70 degrees F (17.8 to 21.1 degrees C)

*Frost-free period:* 190 to 260 days

*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range

*Land Resource Unit:* 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### **Map Unit Composition**

Yana and similar soils: 90 percent

Minor components: Bucklebar, Queencreek, Contention

### Soil Properties and Qualities

#### Yana soils

*Taxonomic classification:* Coarse-loamy, mixed, superactive, nonacid, thermic Typic Torriorthents

*Geomorphic position:* generally on treads

*Parent material:* mixed fan alluvium

*Slope:* 0 to 5 percent

*Surface cover:*

Biological crust

    Cyanobacteria: 0 percent

    Lichen: 0 percent

    Moss: 0 percent

Chemical crust

    Salt: 0 percent

    Gypsum: 0 percent

Physical cover

    Canopy plant cover: 50 percent

    Woody debris: 5 percent

    Bare soil: 20 percent

    Rock fragments:

- gravel: 30 percent

*Drainage class:* well drained

*Ksat solum:* 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

*Available water capacity total inches:* 4.8 (low)

*Shrink-swell potential:* about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Sandy Upland 8-12" p.z.

*Ecological site number:* R041XB214AZ

*Present vegetation:* mesquite, catclaw acacia, plains bristlegrass, annual grasses, broom snakeweed, burroweed, desert zinnia, bush muhly

*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle Benson; about 1,250 feet west and 1,600 feet south of the northeast corner of section 21, Township 17 south, Range 20 east

*Geographic Coordinate System:* 31° 56' 45.00" north, 110° 18' 10.00" west

A—0 to 1 inch (0 to 3 cm); reddish yellow (7.5YR 6/6) gravelly loamy sand, brown (7.5YR 4/4), moist; 8 percent clay; weak medium platy structure; loose, nonsticky and nonplastic; many very fine and fine roots; many fine irregular pores; 25 percent gravel; noneffervescent; slightly alkaline, pH 7.5; clear smooth boundary.

C—1 to 60 inches (3 to 152 cm); brown (7.5YR 5/4) gravelly coarse sandy loam, brown (7.5YR 4/4), moist; 11 percent clay; massive; loose, nonsticky and nonplastic; common very fine and few fine roots; many very fine irregular pores; 20 percent gravel; noneffervescent; slightly alkaline, pH 7.5.

### Range in Characteristics

Rock fragments: 10 to 30 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)  
 Average clay content in the control section: 5 to 15 percent  
 Calcium carbonate equivalent: 0 to 3 percent

A and C horizons

Hue: 10YR, 7.5YR  
 Value: 4 to 6 dry, 3 to 5 moist  
 Chroma: 3 to 6, dry or moist  
 Texture: loamy sand, coarse sandy loam, sandy loam

## 88—Yana-Bucklebar complex, 1 to 10 percent slopes

### Map Unit Setting

*Landform(s)*: fan terraces  
*Elevation*: 3,600 to 4,100 feet (1,097 to 1,250 meters)  
*Mean annual precipitation*: 10 to 12 inches (254 to 305 millimeters)  
*Mean annual air temperature*: 62 to 68 degrees F (16.7 to 20.0 degrees C)  
*Mean annual soil temperature*: 64 to 70 degrees F (17.8 to 21.1 degrees C)  
*Frost-free period*: 190 to 260 days  
*Major Land Resource Area*: 41; Southeastern Arizona Basin and Range  
*Land Resource Unit*: 41-2; Chihuahuan-Sonoran Desert Shrub Mix

### Map Unit Composition

Yana and similar soils: 60 percent  
 Bucklebar and similar soils: 30 percent  
 Minor components: Queencreek, Boderline, Ugyp, Contention

### Soil Properties and Qualities

#### Yana soils

*Taxonomic classification*: Coarse-loamy, mixed, superactive, nonacid, thermic Typic Torriorthents  
*Geomorphic position*: side slopes  
*Parent material*: mixed fan alluvium  
*Slope*: 2 to 10 percent  
*Surface cover*:  
 Biological crust  
 Cyanobacteria: 0 percent  
 Lichen: 0 percent  
 Moss: 0 percent  
 Chemical crust  
 Salt: 0 percent  
 Gypsum: 0 percent  
 Physical cover  
 Canopy plant cover: 50 percent  
 Woody debris: 5 percent  
 Bare soil: 20 percent  
 Rock fragments:  
 • gravel: 30 percent  
*Drainage class*: well drained  
*Ksat solum*: 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)  
*Available water capacity total inches*: 4.8 (low)  
*Shrink-swell potential*: about 1.5 LEP (low)

*Flooding hazard:* none

*Runoff class:* medium

*Hydrologic group:* B

*Ecological site name:* Sandy Upland 8-12" p.z.

*Ecological site number:* R041XB214AZ

*Present vegetation:* mesquite, catclaw acacia, plains bristlegrass, annual grasses, broom snakeweed, burroweed, desert zinnia, bush muhly

*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle Benson; about 1,250 feet west and 1,600 feet south of the northeast corner of section 21, Township 17 south, Range 20 east

*Geographic Coordinate System:* 31° 56' 45.00" north, 110° 18' 10.00" west

A—0 to 1 inch (0 to 3 cm); reddish yellow (7.5YR 6/6) gravelly loamy sand, brown (7.5YR 4/4), moist; 8 percent clay; weak medium platy structure; loose, nonsticky and nonplastic; many very fine and fine roots; many fine irregular pores; 25 percent gravel; noneffervescent; slightly alkaline, pH 7.5; clear smooth boundary.

C—1 to 60 inches (3 to 152 cm); brown (7.5YR 5/4) gravelly coarse sandy loam, brown (7.5YR 4/4), moist; 12 percent clay; massive; loose, nonsticky and nonplastic; common very fine and few fine roots; many very fine irregular pores; 20 percent gravel; noneffervescent; slightly alkaline, pH 7.5.

### Range in Characteristics

Rock fragments: 10 to 30 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in control section: 5 to 15 percent

Calcium carbonate equivalent: 0 to 3 percent

#### A and C horizons

Hue: 10YR, 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 3 to 6, dry or moist

Texture: loamy sand, coarse sandy loam, sandy loam

#### Bucklebar soils

*Taxonomic classification:* Fine-loamy, mixed, superactive, thermic Typic Haplargids

*Geomorphic position:* shoulders

*Parent material:* mixed fan alluvium

*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: 50 percent

Woody debris: 10 percent

Bare soil: 40 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:* 6.0 (moderate)

*Shrink-swell potential:* about 4.5 LEP (moderate)

*Flooding hazard:* none

*Runoff class:* low

*Hydrologic group:* B

*Ecological site name:* Sandy Loam Upland 8-12" p.z.

*Ecological site number:* R041XB215AZ

*Present vegetation:* mesquite, catclaw acacia, plains bristlegrass, annual grasses, broom snakeweed, burroweed, desert zinnia, bush muhly

*Land capability (nonirrigated):* 7c

### Typical Profile

#### Location

*Public Land Survey:* USGS Quadrangle—Benson; about 1,500 feet west and 1,700 feet north of the southeast corner of section 16, Township 17 south, Range 20 east  
*Geographic Coordinate System:* 31° 57' 5.00" north, 110° 18' 5.00" west

A—0 to 2 inches (0 to 5 cm); reddish yellow (7.5YR 6/6) gravelly sandy loam, brown (7.5YR 4/4), moist; 12 percent clay; weak medium platy structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; few fine vesicular pores; 18 percent gravel; noneffervescent; neutral, pH 7.0; clear smooth boundary.

A/B—2 to 10 inches (5 to 25 cm); strong brown (7.5YR 4/6) gravelly sandy loam, dark brown (7.5YR 3/4), moist; 12 percent clay; massive; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; few fine irregular pores; few continuous faint clay bridges between sand grains; 20 percent gravel; noneffervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bt—10 to 40 inches (25 to 102 cm); strong brown (7.5YR 4/6) sandy clay loam, dark brown (7.5YR 3/4), moist; 27 percent clay; weak medium prismatic parting to moderate fine subangular blocky structure; very hard, firm, moderately sticky and moderately plastic; common very fine and fine roots; few very fine irregular pores; common continuous faint clay films on surfaces along pores and clay bridges between sand grains; noneffervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk—40 to 60 inches (102 to 152 cm); reddish yellow (7.5YR 6/6) gravelly loamy sand, strong brown (7.5YR 5/6), moist; 5 percent clay; massive; loose, nonsticky and nonplastic; common very fine roots; few very fine irregular pores; few continuous faint carbonate coating on rock fragments; 20 percent gravel; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

### Range in Characteristics

Rock fragments: 0 to 20 percent

Reaction: 6.6 to 8.4 (neutral to moderately alkaline)

Average clay content in the control section: 18 to 35 percent

#### A horizon

Hue: 7.5YR, 5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 4 to 6, dry or moist

Texture: sandy loam

#### Bt horizon

Hue: 7.5YR, 5YR

Value: 3 or 4, dry or moist  
 Chroma: 4 to 6, dry or moist  
 Texture: sandy clay loam

**Bk horizon**

Hue: 5YR, 7.5YR  
 Value: 5 or 6, dry or moist  
 Chroma: 6, dry or moist  
 Texture: loamy sand  
 Calcium carbonate equivalent: 0 to 10 percent

## **89—Yarbam-Rock outcrop complex, 15 to 65 percent slopes**

### **Map Unit Setting**

*Landform(s):* mountains  
*Elevation:* 4,600 to 6,800 feet (1,402 to 2,073 meters)  
*Mean annual precipitation:* 16 to 20 inches (406 to 508 millimeters)  
*Mean annual air temperature:* 57 to 62 degrees F (13.9 to 16.7 degrees C)  
*Mean annual soil temperature:* 59 to 64 degrees F (15.0 to 17.8 degrees C)  
*Frost-free period:* 160 to 210 days  
*Major Land Resource Area:* 41; Southeastern Arizona Basin and Range  
*Land Resource Unit:* 41-1; Mexican Oak-Pine Woodland and Oak Savannah

### **Map Unit Composition**

Yarbam and similar soils: 70 percent  
 Rock outcrop: 25 percent  
 Minor components: Carbine, soils that have a laminar cap on limestone

### **Soil Properties and Qualities**

#### **Yarbam soils**

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Aridic Lithic Haplustolls

*Geomorphic position:* generally on mountaintops and mountain flanks

*Parent material:* slope alluvium and residuum derived from limestone

*Slope:* 15 to 65 percent

#### *Surface cover:*

##### Biological crust

Cyanobacteria: 0 percent

Lichen: 0 percent

Moss: 0 percent

##### Chemical crust

Salt: 0 percent

Gypsum: 0 percent

##### Physical cover

Canopy plant cover: 30 percent

Woody debris: 0 percent

Bare soil: 0 percent

Rock fragments:

- gravel: 15 percent

- cobble: 55 percent

*Depth to restrictive feature(s):* 6 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*: 1.1 (very low)

*Shrink-swell potential*: about 1.5 LEP (low)

*Flooding hazard*: none

*Runoff class*: very high

*Hydrologic group*: D

*Ecological site name*: Limestone Hills 16-20" p.z.

*Ecological site number*: R041XA103AZ

*Present vegetation*: sideoats grama, false mesquite, slim tridens, black grama, Palmer agave, banana yucca, littleleaf sumac, rough tridens, blue threeawn, hairy grama

*Land capability (nonirrigated)*: 6c

### Typical Profile

#### Location

*Public Land Survey*: USGS Quadrangle—Steele Hills about 700 feet west and 1,000 feet north of the southeast corner of section 15, Township 15 south, Range 22 east

*Geographic Coordinate System*: 32° 8' 5.00" north, 110° 4' 55.00" west

A1—0 to 3 inches (0 to 8 cm); dark brown (7.5YR 3/3) very cobbly loam, black (7.5YR 2.5/1), moist; 16 percent clay; moderate medium platy parting to moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine irregular pores; many continuous distinct carbonate coats on rock fragments; 20 percent gravel and 35 percent cobble; slightly effervescent, 20 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; clear smooth boundary.

A2—3 to 12 inches (8 to 30 cm); very dark gray (7.5YR 3/1) very stony loam, black (7.5YR 2.5/1), moist; 16 percent clay; moderate fine and medium subangular blocky structure; soft, friable, slightly sticky and moderately plastic; common very fine and fine roots; many very fine and fine tubular pores; many continuous distinct carbonate coats on rock fragments; 10 percent gravel and 30 percent stone; strongly effervescent, 24 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; abrupt wavy boundary.

R—12 to 60 inches (30 to 152 cm); unweathered limestone bedrock.

### Range in Characteristics

Rock fragments: 35 to 60 percent

Reaction: 7.4 to 8.4 (slightly to moderately alkaline)

Average clay content in the control section: 7 to 18 percent

Calcium carbonate equivalent: 20 to 30 percent

#### A horizons

Hue: 7.5YR, 10YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 1 to 3, dry or moist

Texture: loam, sandy loam

#### Rock outcrop

Rock outcrop consists of barren rock that occurs as ledges, massive rock piles, and nearly vertical cliffs of limestone. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the summit of mountains.



# Formation of Soils

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Soil is the natural medium for the growth of plants. Most soils formed in material weathered from rocks. Even more important than this parent material are the changes made by plants. Thus, soil forms through the influences of both physical and biological forces. It is especially the biological forces that give those characteristics to a soil or landscape that are most important to humans. Essentially, all life depends upon the soil. There can be no life without soil and no soil without life. They have evolved together.

All features of the natural landscape, conceived of as the total environment for living organisms, are interdependent. There is a relationship between climate and vegetation, between parent rock and vegetation, between age and slope, and even between climate and slope. All express themselves in the soil, which is the final synthetic expression of the forces in the natural landscape working together. The nature of the landscape can be characterized better, more completely, and more directly by this expression than by any other factor or combination of factors.

Soil is the result of the combined and integrated effects of climate and the living organisms acting upon the parent material, as influenced by topography and local relief over time. Soils are dynamic, natural bodies on the earth's surface that are capable of supporting plants. They are composed of mineral and organic material, including dilute solutions, gaseous mixtures, and micro-organisms.

Tremendous diversity occurs in soils as a result of unique combinations of soil-forming factors. Differences in soil morphology, expressed in a vertical cross section through soil horizons, result from the combined interaction of climate, living organisms, parent material, topography, and time. Soil horizons are continually evolving in response to these factors.

## Climate

Climate, past and present, strongly affects soil formation. Temperature and moisture affect the weathering of parent material, the release and leaching and/or accumulation of nutrients, and the activity of micro-organisms. They also influence the native plant community growing on the soil, which in turn influences soil formation. Wind and water transport soil material over long distances, and solar radiation affects soil moisture retention and oxidation of surface organic matter. In general, the intensity of weathering processes increases as both temperature and moisture increase.

## Living Organisms

The living organisms that influence soil formation include micro-organisms as well as plants and animals. Within the soil, the life processes of bacteria, algae, fungi, and protozoa decompose organic matter and minerals, releasing oxygen, carbon dioxide, and nitrogen to plants. Insects and worms burrow into the soil, redistributing soil material and creating channels for air and water movement. Animals trample and mix soil material, add and bury organic debris, and burrow into the ground. Surface plants add organic matter to the soil, create pores and channels with rooting networks,

decrease the extent of erosion and the rate of surface water runoff, and affect physical and chemical properties with their decomposed residue. This survey area has distinct native plant communities that are related to the environmental factors of soil formation.

## **Parent Material**

Parent material is the unconsolidated mineral and organic material in which soil forms. It can be derived in place from the underlying bedrock (residuum), or transported by wind (eolian material), water (alluvium), or gravity (colluvium). A soil that formed in residuum derived from granite bedrock on a nearly level summit will be very different from a soil that formed in an alluvial stream deposit derived from limestone. The chemistry, structure, grain-size distribution, and other factors of parent material are important constituents in soil formation. The soils in this survey area formed in a wide variety of parent materials.

## **Topography**

Topography influences soil formation through its effect on water movement and on the stability of soil material. The rate of surface water runoff and the extent of erosion by water or gravitational forces increase on steep slopes, lessening the amount of time available for soil formation. Northern aspects of steep slopes receive less solar radiation than southern aspects and consequently lose less moisture to evapotranspiration. Runoff from adjoining uplands collects in level or concave areas, where organic matter and sediments drop out of the alluvial waters. On steep and very steep slopes, the soils commonly are unstable, and erosion occurs faster than the processes of soil formation. These soils are commonly shallow and show minimal development of genetic horizons. Soils on lesser slopes tend to be more stable and develop distinct genetic horizons over time. In areas of alluvial deposition, the surface horizons are somewhat thicker and higher in content of organic matter.

The topography of the survey area ranges from broad, nearly level to gently sloping areas to steep areas near escarpments. Some areas are broken by deeply entrenched, rugged canyons and washes that have steep to nearly vertical escarpments. The washes and canyons have nearly level to gently sloping areas of alluvial deposits in drainageways.

## **Time**

Time refers to the duration of the period that a parent material has been in place and has been influenced by other soil-forming factors. The age of a soil is related to the age or stability of the geomorphic surface on which it formed, rather than the age of the landscape. Mountains are much older than the alluvial and colluvial deposits at the base of the slopes of those mountains, but the surface of the more stable alluvial deposits may be much older than the more unstable mountain side slopes. Certain soil characteristics require long periods to become well expressed.

Young soils tend to lack expressions of soil development, whereas older soils generally have well developed genetic horizons. Soils on flood plains are subject to constant reworking and deposition of sediment during periods of flooding. Many soils on steep and very steep slopes are subject to the influence of gravity and erosion and thus do not have enough time to develop genetic horizons.

## Landforms of the Survey Area

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The survey area is part of the Sonoran and Southeastern Arizona Basin and Range Province, which is characterized by numerous mountain ranges that rise abruptly from broad, plain-like valleys or basins. Landforms are not static; they are continually being created and eroded. Some landforms are hard to distinguish; their boundaries are not always sharp but fold and blend into each other naturally. The following paragraphs describe the major landforms recognized in the survey area and some of the soils associated with these landforms.

**Flood plains** are continually being formed from Holocene and present-day stream alluvium. Floodwaters in the survey area flow at low to very low slope gradients adjacent to basin floor and fan terraces. The soils on the flood plains receive periodic depositions of fresh alluvium, resulting in an irregular decrease in organic matter and weak or no soil profile development. The sediment load of the floodwater tends to be sandy to clayey. Typical soils on the flood plains in this survey area are the Cascabel, Gila, Glendale, Hantz, and Guest series.

**Alluvial fans** are formed from Holocene and present-day material originating from mountains and hills or other upslope areas. Sediment loads are deposited when slope gradients change from upland positions to lower segments on the landscape. An inherent feature of fan development is the continuously changing pattern of channels and loci of deposition (Cooke and Warren, 1973). Over a long period of time, these changes ensure the maintenance of fans formed through wide distribution of material on the surface (Cooke and Warren, 1973). The alluvial areas in this survey area generally have two forms; 1) triangular alluvial fans, which formed from the high hills or the high fronts, and 2) long and narrow or elongated fans inset between fan terraces. Typical soils on the alluvial fans in this survey area are the Combate, Lanque, Durazo, and Brazito series.

**Stream terraces** are the erosional remnants of Pleistocene to middle Holocene flood plains. The slopes face in the same general direction as those of the current flood plains. The soils on the terraces are underlain by stratified sand, gravel, or loamy or clayey sediments or, in some areas, by buried paleosols. The soils on stream terraces have been stable long enough for cambic and young calcic and argillic horizons to form. They are not subject to flooding. Typical soils on the stream terraces in this survey area are the Yana and Baboquivari series.

**Relict lakebeds** were developed during the late to mid Pleistocene and Pliocene eras. These soils generally formed when the base level of the valley was much higher and the San Pedro Valley was made up of wetlands and marshes. The soils in the lakebeds formed in lake and playa sediments having little or no gravel. They have varying accumulations of gypsum and salts. The accumulation of gypsum is related to a high water table, which occurred at some time in the process of soil development. Many different forms of gypsum include hard, rocklike nodules (petronodes); cemented gypsum layers; interbedded bedrock; and soft and hard gypsum masses and crystals. Soil affected by gypsum has a high to very high hazard of erosion. After the base level fell and the valley began to erode, remnants of old lakebeds were preserved. Typical soils on the relict lake beds in this survey area are the Contention and Whitecliff series.

**Fan terraces** developed during the middle Pleistocene and early Holocene eras. They are relict alluvial fans that are no longer sites of active deposition. They vary greatly in their makeup. The soils on fan terraces exhibit different stages of soil development, which is characterized by well developed argillic, calcic, gypsic, and cemented horizons. Fan terraces have been strongly dissected or eroded to the point that they are never or rarely subject to flooding. They range from nearly level to steep. Commonly, the soils on the higher, steeper fan terraces closest to the mountain fronts have more rock fragments than the soils on the lower, nearly level fan terraces, which have very few rock fragments. Typical soils on the fan terraces in this survey area are the Terrarossa, Tombstone, Courtland, Sasabe, and Delnorte series.

**Pediments** developed during the middle Pleistocene and early Holocene eras. They are broad, level or gently sloping, rock-floored erosion surfaces of low relief at the base of abrupt and receding mountains and are underlain by bedrock. They are bare in some areas but more commonly are partly mantled with a thin, discontinuous veneer of alluvium derived from upland masses and in transit across the surface. Pediments tend to have a rolling landscape. The depth to bedrock ranges from less than 20 inches to more than 60 inches. Typical soils on the pediments in the survey area are the Cherrycow series and Slaughter family.

**Hills and mountains** are characterized by soil development that is highly dependent on the nature of the bedrock, such as its chemical composition, grain size, and hardness. The most influential soil-forming factors on the hills and mountains are time and the slope gradient of the bedrock. The soils on these landforms vary greatly in soil development. Some show no evidence of development, and others have well developed argillic, calcic, and/or petrocalcic horizons. The soils that show little or no evidence of horizon development generally are on the steeper slopes, where erosional activity is greatest. The soils that have well developed horizons generally are on gently sloping to moderately steep slopes, where the hazard of erosion is slight or moderate. Typical soils on the steeper hills and mountains are Budlamp, Lampshire, Kuykendall and Mabray series; and soils on moderate slopes are Romero, Oracle, and Cherrycow series.

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## Glossary

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- 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, relatively flat to gently sloping mass of loose rock material that is shaped like an open fan or segment of a cone. This alluvial material is deposited by a stream at the place where it issues from a narrow mountain valley into a plain or broad valley, or where a tributary stream joins a main stream, or wherever constriction in a valley abruptly ceases or the gradient of the stream suddenly decreases. The fan is steeper near the mouth of the valley, where its apex points upstream, and it slopes gently and convexly outward with gradually decreasing gradient.
- Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.
- Alpha,alpha-dipyridyl.** A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.
- 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.
- 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 2.5     |
| Low .....       | 2.5 to 5     |
| Moderate .....  | 5 to 7       |
| High .....      | 7 to 10      |
| Very high ..... | more than 10 |
- 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.** Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid

regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

**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.

**Basin floor.** A general term for the nearly level to gently sloping bottom surface of an intermountain basin (bolson). Component landforms include playas, broad alluvial flats containing ephemeral drainageways, and relict alluvial and lacustrine surfaces that rarely if ever are subject to flooding. Where drainage systems are well-developed, alluvial plains are dominant and lake plains are absent or limited in extent. Basin floors grade mountainward to distal parts of the piedmont slopes.

**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).

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**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.

**Boulders.** Rock fragments larger than 2 feet (60 centimeters) in diameter.

**Breaks.** The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

**Breccia.** A coarse grained, clastic rock composed of angular, broken rock fragments held together by a mineral cement or a fine grained matrix.

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

**Calcic horizon.** This is a horizon of calcium carbonate or calcium and magnesium carbonate accumulation. If the texture of the soil is greater than 18 percent clay the calcic horizon will be more than six inches thick and have more than 15 percent calcium carbonate equivalent and at least 5 percent calcium carbonate equivalent is required.

**Calcium carbonate.** Is used interchangeably with lime or limy.

**Caliche.** A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds directly beneath the solum, or it is exposed at the surface by erosion.

**Cambic horizon.** A horizon characterized by the formation of calcium carbonate coatings in root channels and on the surface of gravel. In some cases clay bridges have begun to form between sand grains and clay films in root channels.

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

**Capillary water.** Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

**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 chanter.

**Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

**Clay depletions.** Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

**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.

**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.** Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

**Complex slope.** Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

**Complex, soil.** A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

**Concretions.** Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

**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.

**Coppice dune.** A small dune of fine grained soil material stabilized around shrubs or small trees.

**Corrosion.** Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

- Dense layer.** 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.** On a desert surface, a layer of gravel or larger fragments that was emplaced by upward movement of the underlying sediments or that remains after finer particles have been removed by running water or the wind.
- Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.
- Drainage class (natural).** Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the “Soil Survey Manual.”
- Drainage, surface.** Runoff, or surface flow of water, from an area.
- Drainageway.** A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.
- 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.
- Effervescence.** In the field, cold 10 percent hydrochloric acid is used to test for carbonates. The amount and expression of effervescence is affected by size distribution and mineralogy as well as the amount of carbonates. Consequently, effervescence cannot be used to estimate the amount of carbonate. Four classes of effervescence are recognized: noneffervescent—few to none bubbles seen, slightly effervescent—bubbles readily seen, strongly effervescent—bubbles form low foam, violently effervescent—thick foam forms quickly.
- Eluviation.** The movement of materials 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.
- Eolian soil material.** Material transported and deposited by the wind. It includes earth material, such as sand, silt, and clay, and chemical material, such as calcium carbonate.
- 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.
- 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 the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

**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. Synonym: scarp.

**Extrusive rock.** Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

**Fan alluvium.** Unconsolidated clastic materials deposited on alluvial fans and fan terraces by running water, including gravel, sand, silt, clay and various mixtures of these.

**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.

**Fan terrace.** A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

**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.

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

**Fissure.** Earth fissure is a geological event of land cracks or crevices, a break in the earth's surface. They can then grow considerably by water erosion. Fissures can be very deep and are usually measured in hundreds of feet long. Fissures can be a few inches to many feet wide.

**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.

**Flooding frequency classes.** None—No reasonable possibility of flooding (near 0 percent chance of flooding in any year). Rare—Flooding unlikely but possible under unusual weather conditions (from near 0 to 5 percent chance or near 0 to 5 times in 100 years). Occasional—Flooding is expected infrequently under usual weather conditions (5 to 50 percent chance of flooding or 5 to 50 times in 100 years). Frequent—Flooding is likely to occur often under usual weather conditions (more than a 50 percent chance of flooding or more than 50 times in 100 years). Common—Occasional and frequent classes can be grouped for certain purposes and called common flooding.

**Flood plain.** A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

**Fluvial.** Of or pertaining to rivers; produced by river action, as a fluvial plain.

**Foothill.** A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

**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.

- 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.
- Hardpan.** A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.
- Head slope (geomorphology).** A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.
- 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 depends 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.
- Holocene.** An epoch of the Quaternary period from the end of the Pleistocene to the present time. Approximately 0 to 10,000-12,000 years BP.
- 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.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff potential.

The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

**Igneous rock.** Rock formed by solidification from a molten or partially molten state.

Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

**Illuviation.** The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

**Impervious soil.** A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

**Inclusions.** Soil components or miscellaneous areas that are not identified in the named map unit. Many areas of these components are too small to be delineated separately or cannot be identified by practical field methods or are deliberately placed in map units to avoid excessive detail on the map or legends. These are two types of inclusions. Similar inclusions are the named components in characteristics and properties and have the same major interpretations. Contrasting inclusions (Minor Components) differ appreciably in one or more properties and the differences generally are great enough to affect major interpretations.

**Induration.** The hardening of a soil horizon by chemical action to form a hardpan.

**Infiltration.** The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

**Infiltration 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.

**Inset fan.** A special flood plain along a commonly ephemeral stream that is confined between fan remnants, basin floor remnants, or fan terraces. Its transversely level cross section is evidence of alleviation of a fluve. The fan must be wide enough for raw channels to cover only a fraction of the component landform's surface.

**Intake rate.** The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2 .....	very low
0.2 to 0.4 .....	low
0.4 to 0.75 .....	moderately low
0.75 to 1.25 .....	moderate
1.25 to 1.75 .....	moderately high
1.75 to 2.5 .....	high
More than 2.5 .....	very high

- Interfluve.** An elevated area between two drainageways that sheds water to those drainageways.
- 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.** Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.
- Ksat.** Saturated hydraulic conductivity. (See Permeability.)
- Lacustrine deposit.** Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.
- Landform.** Any recognizable physical form or feature of the earth's surface having a characteristic shape and resulting from natural causes.
- Lava flow.** A lateral surficial outpouring of molten lava from a vent or a fissure; also, the solidified body of rock that is so formed.
- Leaching.** The removal of soluble material from soil or other material by percolating water.
- Lime.** Chemically, lime is calcium oxide, but as the term is commonly used, it also refers to calcium carbonate and calcium hydroxide.
- 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-bar 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.
- Masses.** Soft concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.
- Mass movement.** A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.
- Medium textured soil.** Very fine sandy loam, loam, silt loam, or silt.
- Metamorphic rock.** Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.
- 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 has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

**Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

**Mottling, soil.** Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—few, common, and many; size—fine, medium, and coarse; and contrast—faint, distinct, and prominent. The size measurements are of the diameter along the greatest dimension. Fine indicates less than 5 millimeters (about 0.2 inch); medium, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).

**Mountain.** A 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.

**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.** Hard 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(geomorphology).** A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

**Organic matter.** Plant and animal residue in the soil in various stages of decomposition.

**Paleosol.** A soil that formed on a landscape in the past and that has distinctive morphological features resulting from a soil-forming environment that no longer exists at the site. The former pedogenic process was either altered because of external environmental change or interrupted by burial.

**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.

**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.

**Pediment.** A broad, flat or gently sloping, rock-floored erosion surface or plain of low relief. It typically was developed by subaerial agents in an arid or semiarid region at the base of an abrupt and receding mountain front or plateau escarpment. It is underlain by bedrock that may be bare but more often is partly mantled with a thin and discontinuous veneer of alluvium derived from the upland masses and in transit across the surface.

**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:

Extremely slow .....	0.0 to 0.01 inch
Very slow .....	0.01 to 0.06 inch
Slow .....	0.06 to 0.2 inch
Moderately slow .....	0.2 to 0.6 inch
Moderate .....	0.6 inch to 2.0 inches
Moderately rapid .....	2.0 to 6.0 inches
Rapid .....	6.0 to 20 inches
Very rapid .....	more than 20 inches

**Petrocalcic horizon.** A continuous or fractured, cemented or indurated calcic horizon cemented by carbonates and some silica. This is the same as a lime cemented hardpan or a cemented calcium carbonate hardpan.

**Petronodes.** Petronodes are thought to have formed from calcium and magnesium that precipitated out during periods of a fluctuating seasonal water table and under a climate much wetter than that of the present. Repeated wetting and extreme drying of the soil may have contributed to nodule development. The nodules have no internal organization and break down completely in hydrochloric acid but not in water.

**pH value.** A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

**Piping.** Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

**Plasticity index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

**Plastic limit.** The moisture content at which a soil changes from semisolid to plastic.

**Pliocene.** An epoch of the Tertiary period, after the Miocene and before the Pleistocene. Approximately 1,640,000 to 5,200,000 years BP.

**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.

**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.

**Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.

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

**Reaction, soil.** A measure of acidity or alkalinity of a soil, expressed 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

**Redoximorphic concentrations.** Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide.

An indication of chemical reduction and oxidation resulting from saturation.

**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.

**Redoximorphic features.** Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha, alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

**Reduced matrix.** A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

**Regolith.** The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

**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.

**Rill.** A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

**Riser.** The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

**Road cut.** A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

**Rock fragments.** Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

**Root zone.** The part of the soil that can be penetrated by plant roots.

**Runoff.** The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground water runoff or seepage flow from ground water. Runoff of water from a soil is determined by the slope and the hydrologic group.

Slopes				
Hydrologic Groups	0 to 5%	5 to 15%	15 to 30%	30%+
A	Very low	Very low	Low	Low
B	Low	Medium	High	High
C	Low	Medium	High	Very High
D	Medium	High	Very High	Very High

**Saline soil.** A soil containing soluble salts in an amount that impairs growth of plants.

A saline soil does not contain excess exchangeable sodium.

**Salinity.** The degree to which a soil is affected by soluble salts. The amount of total salts in the soil is ascertained by measuring the conductivity of a saturated soil extract. The conductivity is measured in decisiemens per meter (dS/m), which are the same as millimhos per centimeter (mmhos/cm). Classes of salinity are nonsaline, 0 to 2 dS/m; very slightly saline, 2 to 4 dS/m; slightly saline, 4 to 8 dS/m; moderately saline, 8 to 16 dS/m; and strongly saline, 16 to 32 dS/m.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Sandstone.** Sedimentary rock containing dominantly sand-sized particles.

**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.

**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.

**Shrink-swell.** The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, building foundations, dams, and other structures. It can also damage plant roots.

**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.

**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.

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

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Siltstone.** 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. In this survey, classes for simple slopes are as follows:

Nearly level .....	0 to 3 percent
Gently sloping or undulating .....	3 to 7 percent
Strongly sloping or rolling .....	7 to 15 percent
Moderately steep or hilly .....	15 to 25 percent
Steep .....	25 to 55 percent
Very steep .....	55 percent and higher

**Slope alluvium.** Sediments gradually transported on mountain or hill slopes primarily by alluvial processes and characterized by particles sorting. In a profile sequence, the sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. They contrast with unsorted colluvial deposits because of the sorting of rounded or subrounded gravel or cobbles and buried peds.

**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  $\text{Na}^{++}$  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 alluvium.** Unconsolidated clastic material deposited on stream terraces by running water, including gravel, sand, silt, clay and various mixtures of these.

**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; and representing the dissected remnants of an abandoned flood plain, stream bed, or valley floor produced during a former stage of 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.

**Swale.** A slight depression in an area of generally level land.

**Talus.** Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.

**Taxadjunct.** Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjunct to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjunct 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.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

**Terrace (geologic).** An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and

sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

**Toeslope.** The 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.

**Trace elements.** Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

**Tread.** The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

**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.

**Urban land.** Areas of soil so altered by construction or obscured by structures and pavement that identification of the soil is difficult or impossible.

**Volcanic cone.** A conical hill of lava and/or pyroclastics that is built up around a volcanic vent. It may be intersected by dikes.

**Valley fill.** Alluvium deposited by heavily loaded streams.

**Water bars.** Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

**Water erosion classes.** Water erosion is determined by the soil erodibility factor (K factor) of the soil's surface texture and percent slope. The K factor is a measure of the susceptibility of a soil to particle detachment and transport by rainfall. It is a quantitative value, experimentally determined.

**Weathering.** All physical and chemical changes produced in rocks or other deposits

		Percent	Slope	
K factor	0 to 5	5 to 15	15 to 30	30+
0.02 - 0.20	Slight	Slight	Moderate	Severe
0.24 - 0.37	Slight	Moderate	Severe	Severe
0.43 - 0.69	Moderate	Severe	Severe	Severe

For soils in which the content of gypsum is 5 percent or more, the hazard of water erosion is as follows:

		Percent	Slope	
K factor	0 to 5	5 to 15	15 to 30	30+
0.02 - 0.20	Slight	Moderate	Severe	Severe
0.24 - 0.37	Moderate	Severe	Very Severe	Very Severe
0.43 - 0.69	Severe	Very Severe	Very Severe	Very Severe

at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

**Well graded.** Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

**Wilting point (or permanent wilting point).** The moisture content of soil, on an 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.

**Wind Erodibility Group.** A wind erodibility group (WEG) is a collection of soils that have similar properties affecting their resistance to soil blowing. The groups indicate the susceptibility to blowing. The lower the number the more susceptible the soil is to wind erosion. The hazard of wind erosion for each of the various wind erodibility groups is as follows:

- 1 ..... very high
- 2 ..... high
- 3 ..... moderately high
- 4, 4L ..... moderate
- 5 – 7 ..... slightly
- 8 ..... very slightly

# **NRCS Accessibility Statement**

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